Environment Canada
Conservation and Protection
Industrial Programs Branch
Ottawa, Ontario

Background Study of Proposed Amendments to Pulp Industry Regulations on Organochlorines and Dioxins

Capital and Operating Cost Estimate Calculation Sheets for Primary and Secondary Treatment Systems for Individual Mills

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EFFLUENT TREATMENT SYSTEM COST ESTIMATES

The attached data sheets summarize the estimated capital and operating costs that each Canadian pulp paper, or paperboard mill would have to incur to comply with the currently proposed Federal regulations under the Fisheries Act concerning BOD, TSS, and acute toxicity to fish.

In all cases, the costs are based on mills as they existed in late 1989, so that a mill which complies with all these regulations because of its inherent process and/or because of prior expenditure is shown as having zero cost, or is omitted. Mills which discharge all effluent to a municipal system are considered to be in compliance. Individual estimates were calculated for each mill. In most cases one or more of the individuals calculating the estimated has first hand knowledge of the mill site. In other cases drawings were obtained and/or telephone interviews were undertaken with engineers who are familiar with the site. All evaluations of site conditions were compared with Beak 1985 and all apparent anomalies verified.

Costs are generally based on Environment Canada file data on effluent quality and production rates for 1987 (the latest full year available). However, where the authors have knowledge of major changes since that time, these were incorporated as noted in individual sheets. Effluent treatment plants which are under of construction were considered to exist, while systems which are "announced" or "committed" but not yet under construction were ignored.

Appropriate processes were selected from one or more of the following widely proven alternatives, in accordance with mill site restrictions, local climate and existing effluent quality:

- Primary clarifier
- Aerated Stabilization Basin
- Activated Sludge
- Sludge dewatering by twin wire press
- Anaerobic (only where mill has indicated preference for this process)

The necessary main effluent pipelines, pump stations, roads, aeration equipment (including power supply), secondary clarifiers, sludge thickeners, and reaction vessels were sized using conventional engineering practice. The cost of installing an underwater outfall was calculated where none exists at present. The estimated capital costs of all major elements include allowances for the related auxiliary equipment, such as controls, lighting, engineering, contingencies, owner's overhead, etc. Costs for each element were calculated for an average central Canada, rural location on the basis of the capacity of each element. Some special site allowances were added for piles, restricted locations, etc.

The attached sheets are in West to East geographical order, so that each province is grouped.

Pulp and Paper companies who wish to present their own cost estimates based on detailed engineering studies are invited to submit them to:

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MACMILLAN BLOEDEL LTD. **PORT ALBERNI** **B.C.**

Effluent data ——> 210,538 10,352 12,456 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	25,000	cu. m/day	0.1	km long	$32,866	Bleach Plant Effluent
Gravity Pipeline 2	106,000	cu. m/day	0.1	km long	$84,050	Expanded ASB to existing ASB
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	25,000	cu. m/day	0.3	km long	$60,984	Bleach effluent to prim clarifier outlet
Forcemain 2	106,000	cu. m/day	0.1	km long	$60,065	Existing ASB to expanded ASB
Pump Station 1	25,000	cu. m/day	1		$912,871	Bleach effluent
Pump Station 2	106,000	cu. m/day	1		$1,879,716	Existing ASB to expansoin
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	100,000	Dollars	————	Lump Sum	$100,000	In mill sewer modifications
Primary Clarifier	0	cu. m/day	0		——	Use existing clarifier
Aerated Stabilisation Basin	12,456	BOD kg/d	1		$4,000,000	Load to additional ASB
Activated Sludge Reactor	0	BOD kg/d	0		——	(based on SSW estimate 1989)
Aerators	12,456	BOD kg/d	1	Systems	$1,419,950	
Nutrient Addition	————		0	Systems	——	
Neutralisation	————		1	Systems	$200,000	Present system inadequate
Secondary Clarifier	0	cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	Existing is adequate
Submerged Outfall		cu. m/day	0	km long	——	Existing surface outfall is best for site
Roads	————		0	Kilometres	——	
Site allowances	7,000,000	Dollars	————	Lump Sums	$7,000,000	Modernise BSW and screens, + misc
Capital cost (excluding inflation and regional factors)					$15,750,502	
(Regional factor = 1.20)			**Capital Cost =**		$18,901,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1089 kw	$0.030	$/kW hour	$261,444	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	—— kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	—— kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	62 kg/day	$0.37	$/kg	$8,065	For aerated Stabilisation basins
Polymer for biosludge	—— kg/day	$14.00	$/kg	——	
Operators	4 man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians	4 man hrs/d	$60.75	$/man hour	$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	$90,000	$/year	$29,700	
Sludge disposal	5 dry t/day	$60.00	$/dry tonne	$105,000	
Maintenance	Total maintenance labour and materials		=	$472,525	2.5% of capital cost
		Annual Operating Cost =		$1,189,000	

Description of System

600 metres of effluent piping, 2 Effluent Pump Stations.

Use existing primary clarifier, with BSW and screen room modernisation to reduce flow

Additional ASB in series with existing system, with 570 kW installed aeration

STONE-CONSOLIDATED INC. VILLE DE LA BAIE QUEBEC

Effluent data ——> 88,156 12,877 42,681 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	88,156	cu. m/day	0.1	km long	$74,560	Clarifier to Act Sludge reactor
Gravity Pipeline 2	88,156	cu. m/day	0.5	km long	$372,798	Secondary clarifier to outfall
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	88,156	cu. m/day	0.5	km long	$261,547	To primary clarifier
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	88,156	cu. m/day	1		$1,714,218	To primary clarifier
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier	88,156	cu. m/day	1		$2,988,028	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	42,681	BOD kg/d	1		$11,144,311	
Aerators	42,681	BOD kg/d	1	Systems	$4,865,650	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	44,078	cu. m/day	2		$6,252,534	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	22,000	kg/day	1	Systems	$2,720,000	
Submerged Outfall	88,156	cu. m/day	0.5	km long	$3,763,869	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	900,000	Dollars	——	Lump Sums	$900,000	
Capital cost (excluding inflation and regional factors)					$36,757,516	
(Regional factor = 1.05)			**Capital Cost =**		$38,595,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	2786 kw	$0.022	$/kW hour	$490,314	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	$0.09	$/kg Cao	$220,500	
Ammonia	2591 kg/day	$0.40	$/kg NH3	$362,790	For Activated Sludge
Phosphoric Acid	1349 kg/day	$1.03	$/kg H3PO4	$486,414	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	171 kg/day	$14.00	$/kg	$836,550	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	—— dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =			$964,875	2.5% of capital cost
			Annual Operating Cost =	$4,125,000	

Description of System

1100 metres of effluent piping, 1 Effluent Pump Stations.
61 meter dia. Primary Clarifier, 2 x 55 meter dia. Secondary Clarifiers
53400 cu. meter Activated Sludge Reactor with 2430 kW installed aeration
Submerged Outfall 500 metres long

WESTERN PULP LTD. PARTNERSHIP **PORT ALICE** **B.C.**

Effluent data ——> 158,506 4,066 103,725 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	158,506	cu. m/day	0.5	km long	$406,112	From pump station to activated sludge
Forcemain 2		cu. m/day	0	km long	------	reactor, distance from Beak 1985
Pump Station 1	60,000	cu. m/day	2		$2,828,427	One from Clarifier, one from bleach pla
Pump Station 2	0	cu. m/day	0		------	to activated sludge reactor
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	0	Dollars	----------	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	Existing unit is adequate
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	103,725	BOD kg/d	1		$40,749,961	
Aerators	103,725	BOD kg/d	1	Systems	$11,824,600	
Nutrient Addition	----------		1	Systems	$400,000	
Neutralisation	----------		1	Systems	$200,000	
Secondary Clarifier	79,253	cu. m/day	2		$8,023,119	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	36,000	kg/day	1	Systems	$5,600,000	Addition to existing primary sludge
Submerged Outfall		cu. m/day	0	km long	------	dewatering system to process biosludg
Roads	----------		0	Kilometres	------	
Site allowances (arbitrary)	3,000,000	Dollars	----------	Lump Sums	$3,000,000	
Capital cost (excluding inflation and regional factors)					$74,132,218	
(Regional factor = 1.20)			**Capital Cost =**		$88,959,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	6365 kw	$0.030	$/kW hour	$1,527,700	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	$0.09	$/kg Cao	$157,500	
Ammonia	6298 kg/day	$0.40	$/kg NH3	$881,659	For Activated Sludge
Phosphoric Acid	3279 kg/day	$1.03	$/kg H3PO4	$1,182,092	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	415 kg/day	$14.00	$/kg	$2,033,001	
Operators	48 man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	---------- dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials		=	$2,223,975	2.5% of capital cost
		Annual Operating Cost	=	$8,900,000	

Description of System

500 metres of effluent piping, 2 Effluent Pump Stations.

2 x 73 meter dia. Secondary Clarifiers

259300 cu. meter Activated Sludge Reactor with 5910 kW installed aeration

ABITIBI PRICE INC. — ALMA — QUEBEC

Effluent data ——> 91,141 | 6,864 | 34,032 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	91,141	cu. m/day	6	km long	$3,217,941	Two by 3km, distances from Beak 1985
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	91,141	cu. m/day	2		$3,485,996	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Existing 225 ft dia unit is adequate
Aerated Stabilisation Basin	34,032	BOD kg/d	1		$11,075,406	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	34,032	BOD kg/d	1	Systems	$3,879,637	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	0	kg/day	0	Systems	——	
Submerged Outfall	91,141	cu. m/day	0.5	km long	$3,814,339	
Roads	——		2	Kilometres	$50,000	
Site allowances (arbitrary)	900,000	Dollars	——	Lump Sums	$900,000	
Capital cost (excluding inflation and regional factors)					$27,023,318	
(Regional factor = 1.05)			**Capital Cost =**		$28,374,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2276	kw	$0.022	$/kW hour	$400,586	Pumping + aeration + misc
Lime for neutralisation	7000	kg/day	$0.09	$/kg Cao	$220,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	170	kg/day	$0.37	$/kg	$22,036	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$709,350	2.5% of capital cost
			Annual Operating Cost =		$1,486,000	

Description of System

6000 metres of effluent piping, 2 Effluent Pump Stations.

9.3 day retention Aerated Stabilisation Basin with 1940 kW installed aeration
Submerged Outfall 500 metres long

DONOHUE NORMICK INC. **AMOS** **QUEBEC**

Effluent data ——> 26,304 3,813 9,592 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	26,304	cu. m/day	0.2	km long	$67,941	To extend existing ASB
Gravity Pipeline 2		cu. m/day	0	km long	———	
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1		cu. m/day	0	km long	———	
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1		cu. m/day	0		———	
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000	
Primary Clarifier		cu. m/day	0		———	
Aerated Stabilisation Basin	9,592	BOD kg/d	1		$3,970,730	Upgrade of existing ASB
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	9,592	BOD kg/d	1	Systems	$1,093,464	
Nutrient Addition	———		0	Systems	———	
Neutralisation	———		0	Systems	———	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering	0	kg/day	0	Systems	———	
Submerged Outfall		cu. m/day	0	km long	———	Use existing
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$5,732,135	
(Regional factor = 1.05)			**Capital Cost =**		$6,019,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	574	kw	$0.022	$/kW hour	$101,036	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	———	
Ammonia	———	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	48	kg/day	$0.37	$/kg	$6,211	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	———	
Operators	0	man hrs/d	$23.13	$/man hour	———	Inc Fringes and Overhead
Technicians	0	man hrs/d	$50.88	$/man hour	———	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.00	person	$90,000	$/year	———	NO ADDITIONAL LABOUR, because this
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	is a simple upgrade
Maintenance	Total maintenance labour and materials =				$150,475	2.5% of capital cost
			Annual Operating Cost =		$258,000	

Description of System

200 metres of effluent piping.

9.1 day retention Aerated Stabilisation Basin with 550 kW installed aeration

ATHOLVILLE PULP INC. **ATHOLVILLE** **N.B.**

Effluent data ——>	74,553	3,231	22,651	(Flow cu. m/day | TSS kg/d | BOD kg/d)		
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	74,553	cu. m/day	1	km long	$668,636	To outfall, distance from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	74,553	cu. m/day	2	km long	$922,608	To ASB, distance from Beak 1985
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	74,553	cu. m/day	1		$1,576,415	
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Primary Clarifier		cu. m/day	0		———	
Aerated Stabilisation Basin	22,651	BOD kg/d	1		$7,964,467	High cost due to site
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	22,651	BOD kg/d	1	Systems	$2,582,245	
Nutrient Addition	———		0	Systems	———	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering		kg/day	0	Systems	———	
Submerged Outfall	74,553	cu. m/day	0.3	km long	$2,111,881	
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	700,000	Dollars	———	Lump Sums	$700,000	
Capital cost (excluding inflation and regional factors)					$16,726,252	
(Regional factor =	1.15)		**Capital Cost =**		$19,235,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1551	kw	$0.044	$/kW hour	$546,085	Pumping + aeration + misc
Lime for neutralisation	3000	kg/day	$0.09	$/kg Cao	$94,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	113	kg/day	$0.37	$/kg	$14,667	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials			=	$480,875	2.5% of capital cost
			Annual Operating Cost =		$1,269,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

7.6 day retention Aerated Stabilisation Basin with 1290 kW installed aeration
Submerged Outfall 300 metres long

QUEBEC & ONTARIO PAPER CO. LTD. BAIE COMEAU — QUEBEC

Effluent data ——> 145,641 | 14,782 | 70,164 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	145,641	cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	145,641	cu. m/day	8	km long	$6,098,090	Mill to ASB, distance from Beak 1985
Forcemain 2	145,641	cu. m/day	1	km long	$762,261	ASB to outfall, distance from Beak 1985
Pump Station 1	145,641	cu. m/day	1		$2,203,340	Mill to ASB
Pump Station 2	145,641	cu. m/day	1		$2,203,340	ASB to outfall
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	70,164	BOD kg/d	1		$19,901,419	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	70,164	BOD kg/d	1	Systems	$7,998,688	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickenar		Dollars	0		——	
Sludge Dewatering	0	kg/day	0	Systems	——	
Submerged Outfall	145,641	cu. m/day	0.5	km long	$4,600,945	Length from Beak 1985
Roads	——		3	Kilometres	$75,000	
Site allowances (arbitrary)	1,500,000	Dollars	——	Lump Sums	$1,500,000	
Capital cost (excluding inflation and regional factors)					$45,343,083	
(Regional factor = 1.05)			**Capital Cost =**		$47,610,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	4964	kw	$0.022	$/kW hour	$873,651	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	351	kg/day	$0.37	$/kg	$45,431	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$1,190,250	2.5% of capital cost
			Annual Operating Cost =		$2,243,000	

Description of System

9000 metres of effluent piping, 2 Effluent Pump Stations.

12 day retention Aerated Stabilisation Basin with 4000 kW installed aeration
Submerged Outfall 500 metres long

STONE-CONSOLIDATED INC. BATHURST N.B.

Effluent data ——— > 54.990 7.889 46.308 (Flow cu. m/day TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	-------	
Gravity Pipeline 2	cu. m/day	0	km long	-------	
Gravity Pipeline 3	cu. m/day	0	km long	-------	
Forcemain 1	cu. m/day	0	km long	-------	
Forcemain 2	cu. m/day	0	km long	-------	
Pump Station 1	cu. m/day	0		———	
Pump Station 2	cu. m/day	0		———	
Pump Station 3	cu. m/day	0		———	
Lump Sum Piping	Dollars	———	Lump Sum	———	
Primary Clarifier	cu. m/day	0		———	
Aerated Stabilisation Basin	BOD kg/d	0		———	
Activated Sludge Reactor	BOD kg/d	0		———	
Aerators	BOD kg/d	0	Systems	———	
Nutrient Addition		0	Systems	———	
Neutralisation		0	Systems	———	
Secondary Clarifier	cu. m/day	0		———	
Secondary sludge thickener	Dollars	0		———	
Sludge Dewatering	kg/day	0	Systems	———	
Submerged Outfall	cu. m/day	0	km long	———	
Roads		0	Kilometres	———	
Site allowances (arbitrary)	Dollars	———	Lump Sums	———	
Capital cost (excluding inflation and regional factors)					$C
(Regional factor = 1.15)		**Capital Cost =**			$0
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.044	$/kW hour	———	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	———	
Ammonia		kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid		kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient		kg/day	$0.37	$/kg	———	For aerated Stabilisation basins
Polymer for biosludge		kg/day	$14.00	$/kg	———	
Operators		man hrs/d	$23.13	$/man hour	———	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	———	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90.000	$/year	———	
Sludge disposal		dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
		Annual Operating Cost =			$0	

Description of System

Although the 1987 effluent data that this report is based on shows a significant effluent discharge, it is known that the company has installed an anaerobic/aerobic treatment system which is expected to comply with the proposed regulations.

DOMTAR FINE PAPERS INC. **BEAUHARNOIS** **QUEBEC**

Effluent data ——> 10,940 256 1,220 (Flow cu. m/day | TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	----------	Lump Sums	$1,000,000	Allowance for liquor disposal
Capital cost (excluding inflation and regional factors)					$1,000,000	
(Regional factor = 1.05)			**Capital Cost =**		$1,050,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.022	$/kW hour	------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	——	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$26,250	2.5% of capital cost
			Annual Operating Cost =		$26,000	

Description of System

Traditional treatment not required, since municipality accepts most of effluent

Allowed for spent cooking liquor disposal according to company estimate, published PP Canada 1989-1990 Capital expenditures re

Presuming liquor is trucked to Domtar mill at Windsor, Quebec, chemical saving should cover trucking cost

ABITIBI PRICE INC. — BEAUPRE — QUEBEC

Effluent data ——>	43,035	9,987	15,561	(Flow cu. m/day	TSS kg/d	BOD kg/d)	
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**				**COMMENTS**
Gravity Pipeline 1	43,035	cu. m/day	1	km long	$467,815		ASB to outfall, distance from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	-------		
Gravity Pipeline 3		cu. m/day	0	km long	———		
Forcemain 1	43,035	cu. m/day	2	km long	$610,994		Mill to ASB, distance from Beak 1985
Forcemain 2		cu. m/day	0	km long	———		
Pump Station 1	43,035	cu. m/day	1		$1,197,706		Mill to ASB
Pump Station 2	0	cu. m/day	0		———		
Pump Station 3	0	cu. m/day	0		———		
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000		Misc collection
Primary Clarifier		cu. m/day	0		———		
Aerated Stabilisation Basin	15,561	BOD kg/d	1		$5,875,966		
Activated Sludge Reactor		BOD kg/d	0		———		
Aerators	15,561	BOD kg/d	1	Systems	$1,773,939		
Nutrient Addition	———		0	Systems	———		
Neutralisation	———		1	Systems	$200,000		
Secondary Clarifier		cu. m/dav	0		———		
Secondary sludge thickener		Dollars	0		———		
Sludge Dewatering		kg/day	0	Systems	———		
Submerged Outfall	43,035	cu. m/day	0.5	km long	$2,825,283		Length from Beak 1985
Roads	———		2	Kilometres	$50,000		
Site allowances (arbitrary)	400,000	Dollars	———	Lump Sums	$400,000		
Capital cost (excluding inflation and regional factors)					$13,501,703		
(Regional factor = 1.05)			**Capital Cost =**		$14,177,000		
(Inflation factor = 1.00)							Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1044	kw	$0.022	$/kW hour	$183,794	Pumping + aeration + misc
Lime for neutralisation	5000	kg/day	$0.09	$/kg Cao	$157,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	78	kg/day	$0.37	$/kg	$10,076	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.85	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials			=	$354,425	2.5% of capital cost
			Annual Operating Cost =		$839,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

9 day retention Aerated Stabilisation Basin with 890 kW installed aeration
Submerged Outfall 500 metres long

KRUGER INC. — **BROMPTONVILLE** — **QUEBEC**

Effluent data ——> 45,051 | 6,834 | 12,433 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	45,051	cu. m/day	1.3	km long	$626,531	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	45,051	cu. m/day	0.3	km long	$94,851	To Primary clarifier
Forcemain 2	45,051	cu. m/day	1.3	km long	$411,021	To ASB
Pump Station 1	30,000	cu. m/day	1		$1,000,000	
Pump Station 2	6,000	cu. m/day	1		$447,214	
Pump Station 3	45,051	cu. m/day	1		$1,225,442	Mill to ASB
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000	In mill collection
Primary Clarifier	45,051	cu. m/day	1		$2,172,202	
Aerated Stabilisation Basin	12,433	BOD kg/d	1		$4,899,411	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	12,433	BOD kg/d	1	Systems	$1,417,384	
Nutrient Addition	———		0	Systems	------	
Neutralisation	----------		0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall	45,051	cu. m/day	0.2	km long	$1,151,002	
Roads	———		0.5	Kilometres	$12,500	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$16,607,557	
(Regional factor = 1.05)			**Capital Cost =**		$17,438,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	957	kw	$0.022	$/kW hour	$168,412	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	———	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	62	kg/day	$0.37	$/kg	$8,050	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	-------	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	-------	
Maintenance	Total maintenance labour and materials =				$435,950	2.5% of capital cost
			Annual Operating Cost =		$746,000	

Description of System

2900 metres of effluent piping, 3 Effluent Pump Stations.
44 meter dia. Primary Clarifier,
6.9 day retention Aerated Stabilisation Basin with 710 kW installed aeration
Submerged Outfall 200 metres long

FLETCHER CHALLENGE CANADA LTD CAMPBELL RIVER B.C.

Effluent data ——> 257,034 25,242 65,436 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	257,034	cu. m/day	0.5	km long	$747,400	Secondary treatment to outfall
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	150,000	cu. m/day	1	km long	$779,308	For high solids streams
Forcemain 2	55,000	cu. m/day	1.3	km long	$477,371	Bleach plant to activated sludge reactor
Pump Station 1	150,000	cu. m/day	1		$2,236,068	For high solids streams
Pump Station 2	55,000	cu. m/day	1		$1,354,006	Bleach plant to activated sludge reactor
Pump Station 3	0	cu. m/day	0		——	(by-passing clarifier)
Lump Sum Piping	1,000,000	Dollars	——	Lump Sum	$1,000,000	Sewer modifications and collection
Primary Clarifier	150,000	cu. m/day	1		$3,846,209	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	65,436	BOD kg/d	1		$27,930,256	
Aerators	65,436	BOD kg/d	1	Systems	$7,459,723	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	128,517	cu. m/day	2		$9,853,019	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	50,000	kg/day	1	Systems	$3,000,000	
Submerged Outfall		cu. m/day	0	km long	——	Use existing outfall
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	2,600,000	Dollars	——	Lump Sums	$2,600,000	
Capital cost (excluding inflation and regional factors)					$62,983,759	
(Regional factor = 1.20)			**Capital Cost =**		$75,580,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	4454 kw	$0.030	$/kW hour	$1,069,075	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	3973 kg/day	$0.40	$/kg NH3	$556,207	For Activated Sludge
Phosphoric Acid	2069 kg/day	$1.03	$/kg H3PO4	$745,740	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	262 kg/day	$14.00	$/kg	$1,282,549	
Operators	48 man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	—— dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials		=	$1,889,500	2.5% of capital cost
		Annual Operating Cost =		$6,752,000	

Description of System

2800 metres of effluent piping, 2 Effluent Pump Stations.
80 meter dia. Primary Clarifier, 2 x 93 meter dia. Secondary Clarifiers
163600 cu. meter Activated Sludge Reactor with 3730 kW installed aeration
(Company is currently building oxygen activated sludge)

CELGAR PULP CO. **CASTLEGAR** **B.C.**

Effluent data ——> 148,933 7,865 40,083 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	148,933	cu. m/day	0.3	km long	$314,524	ASB to river
Gravity Pipeline 2	50,000	cu. m/day	0.5	km long	$257,864	Bleach plant to pumphouse
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	148,933	cu. m/day	3	km long	$2,325,433	Mill to ASB
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	148,933	cu. m/day	1		$2,228,097	Mill to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	40,083	BOD kg/d	1		$12,645,439	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	40,083	BOD kg/d	1	Systems	$4,569,518	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	148,933	cu. m/day	0.2	km long	$1,856,902	
Roads	----------		3	Kilometres	$75,000	
Site allowances (arbitrary)	1,500,000	Dollars	----------	Lump Sums	$1,500,000	
Capital cost (excluding inflation and regional factors)					$25,972,777	
(Regional factor = 1.20)			**Capital Cost =**		$31,167,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2790	kw	$0.030	$/kW hour	$669,587	Pumping + aeration + misc
Lime for neutralisation	10000	kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	200	kg/day	$0.37	$/kg	$25,954	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators	4	man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians	4	man hrs/d	$60.75	$/man hour	$85,047	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$779,175	2.5% of capital cost
			Annual Operating Cost =		$1,943,000	

Description of System

3800 metres of effluent piping, 1 Effluent Pump Stations.

6.7 day retention Aerated Stabilisation Basin with 2280 kW installed aeration
Major mill rebuild probable

GASPESIA PULP & PAPER CO. — CHANDLER — QUEBEC

Effluent data ——> 53,903 | 4,725 | 21,447 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	53,903	cu. m/day	1	km long	$541,546	From ASB to sea, distance from Beak 8
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	53,903	cu. m/day	2	km long	$723,398	From mill to ASB, distance from Beak 1
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	53,903	cu. m/day	1		$1,340,429	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000	Miscellaneous collection
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	21,447	BOD kg/d	1		$7,619,844	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	21,447	BOD kg/d	1	Systems	$2,445,009	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	53,903	cu. m/day	1	km long	$6,183,108	
Roads	———		2	Kilometres	$50,000	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$19,703,334	
(Regional factor = 1.05)			**Capital Cost =**		$20,689,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1425	kw	$0.022	$/kW hour	$250,822	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	107	kg/day	$0.37	$/kg	$13,887	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$517,225	2.5% of capital cost
			Annual Operating Cost =		$1,104,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

9.9 day retention Aerated Stabilisation Basin with 1220 kW installed aeration
Submerged Outfall 1000 metres long

DONOHUE INC. **CLERMONT** **QUEBEC**

Effluent data ——> 65,729 11,882 34,909 (Flow cu. m/day ; TSS kg/d ; BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	65,729	cu. m/day	2	km long	$1,232,141	ASB to river, length from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	65,729	cu. m/day	6	km long	$3,100,000	Mill to ASB, length from Beak 1985
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	65,729	cu. m/day	1		$1,480,189	Mill to ASB
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	500,000	Dollars	-------	Lump Sum	$500,000	Company estimate to segregate sewerx
Primary Clarifier		cu. m/day	0		------	Existing 150 ft dia unit adequate
Aerated Stabilisation Basin	34,909	BOD kg/d	1		$11,306,174	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	34,909	BOD kg/d	1	Systems	$3,979,678	
Nutrient Addition	-------		0	Systems	------	
Neutralisation	-------		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall	65,729	cu. m/day	1	km long	$6,693,687	Length from Beak 1985
Roads	-------		6	Kilometres	$150,000	
Site allowances (arbitrary)	1,500,000	Dollars	----------	Lump Sums	$1,500,000	Difficult location
Capital cost (excluding inflation and regional factors)					$30,141,869	
(Regional factor = 1.05)			**Capital Cost =**		$31,649,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2262	kw	$0.022	$/kW hour	$398,089	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	175	kg/day	$0.37	$/kg	$22,604	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	-------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$791,225	2.5% of capital cost
			Annual Operating Cost =		$1,345,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.

13.3 day retention Aerated Stabilisation Basin with 1990 kW installed aeration
Submerged Outfall 1000 metres long

CORNER BROOK P&P — CORNER BROOK — NFLD.

Effluent data ——> 101,159 (Flow cu. m/day) | 44,929 (TSS kg/d) | 35,301 (BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	101,159	cu. m/day	0.3	km long	$244,604	Misc collection
Gravity Pipeline 2	101,159	cu. m/day	0.5	km long	$407,673	To outfall
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	101,159	cu. m/day	0.1	km long	$57,995	To primary clarifier
Forcemain 2	101,159	cu. m/day	5	km long	$2,899,767	To ASB
Pump Station 1	101,159	cu. m/day	1		$1,836,289	To primary clarifier
Pump Station 2	101,159	cu. m/day	1		$1,836,289	To ASB
Pump Station 3	0	cu. m/day	0		----	
Lump Sum Piping	0	Dollars	----------	Lump Sum	----	
Primary Clarifier	101,159	cu. m/day	1		$3,189,820	
Aerated Stabilisation Basin	35,301	BOD kg/d	1		$17,113,065	Special construction
Activated Sludge Reactor		BOD kg/d	0		----	
Aerators	35,301	BOD kg/d	1	Systems	$4,024,283	
Nutrient Addition	----------		0	Systems	----	
Neutralisation	----------		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		----	
Secondary sludge thickener		Dollars	0		----	
Sludge Dewatering	40,000	kg/day	1	Systems	$2,900,000	
Submerged Outfall	101,159	cu. m/day	0.3	km long	$2,386,085	
Roads	----------		0	Kilometres	----	
Site allowances (arbitrary)	1,000,000	Dollars	----------	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$38,095,870	
(Regional factor = 1.15)			**Capital Cost =**		$43,810,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	2644 kw	$0.044	$/kW hour	$930,629	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	---- kg/day	$0.40	$/kg NH3	----	For Activated Sludge
Phosphoric Acid	---- kg/day	$1.03	$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	177 kg/day	$0.37	$/kg	$22,857	For aerated Stabilisation basins
Polymer for biosludge	---- kg/day	$14.00	$/kg	----	
Operators	8 man hrs/d	$23.13	$/man hour	$64,750	Inc Fringes and Overhead
Technicians	4 man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	$90,000	$/year	$29,700	
Sludge disposal	---- dry t/day	$60.00	$/dry tonne	----	
Maintenance	Total maintenance labour and materials =			$1,095,250	2.5% of capital cost
	Annual Operating Cost =			$2,529,000	

Description of System

5900 metres of effluent piping, 2 Effluent Pump Stations.
65 meter dia. Primary Clarifier,
8.7 day retention Aerated Stabilisation Basin with 2010 kW installed aeration
Submerged Outfall 300 metres long

DOMTAR INC. **CORNWALL** **ONTARIO**

Effluent data ——> 120,000 7,052 28,000 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	120,000	cu. m/day	0.3	km long	$273,325	Secondary Clarifiers to River
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	120,000	cu. m/day	0.5	km long	$329,607	Primary clarifier to act sludge reactor
Forcemain 2	120,000	cu. m/day	0.5	km long	$329,607	Low solids to activated sludge reactor
Pump Station 1	90,000	cu. m/day	1		$1,732,051	Primary clarifier to act sludge reactor
Pump Station 2	30,000	cu. m/day	1		$1,000,000	Low solids to activated sludge reactor
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	200,000	Dollars	------	Lump Sum	$200,000	Misc collection
Primary Clarifier		cu. m/day	0		------	Exists
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	28,000	BOD kg/d	1		$7,887,317	
Aerators	28,000	BOD kg/d	1	Systems	$3,192,000	
Nutrient Addition	------		1	Systems	$400,000	
Neutralisation	------		1	Systems	$200,000	
Secondary Clarifier	60,000	cu. m/day	2		$7,128,129	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	Addition to existing system
Submerged Outfall	120,000	cu. m/day	0	km long	------	Exists
Roads	----------		0	Kilometres	------	
Site allowances (arbitrary)	8,000,000	Dollars	------	Lump Sums	$8,000,000	Piling required
Capital cost (excluding inflation and regional factors)					$34,322,035	
(Regional factor =	1.05)		**Capital Cost =**		$36,038,000	**Flow and BOD estimated**
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1991	kw	$0.038	$/kW hour	$605,203	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	1700	kg/day	$0.40	$/kg NH3	$238,000	For Activated Sludge
Phosphoric Acid	885	kg/day	$1.03	$/kg H3PO4	$319,101	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	112	kg/day	$14.00	$/kg	$548,800	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$900,950	2.5% of capital cost
			Annual Operating Cost =		$3,564,000	

Description of System

1300 metres of effluent piping, 2 Effluent Pump Stations.

2 x 64 meter dia. Secondary Clarifiers

35000 cu. meter Activated Sludge Reactor with 1600 kW installed aeration

SCOTT PAPER LTD. **CRABTREE** **QUEBEC**

Effluent data ——> 21,195 2,104 3,165 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)						$0
(Regional factor = 1.05)			**Capital Cost =**			$0
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.022	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90.000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Company is currently connecting to municipal system

FLETCHER CHALLENGE CANADA LTD CROFTON B.C.

Effluent data ——> 224,228 19,291 56,109 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	40,000	cu. m/day	0.5	km long	$223,048	To new clarifier
Gravity Pipeline 2	224,228	cu. m/day	0.5	km long	$683,923	To existing outfall
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	224,228	cu. m/day	0.5	km long	$526,777	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	224,228	cu. m/day	1		$2,733,907	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	500,000	Dollars	----------	Lump Sum	$500,000	Collection and sewer modifications
Primary Clarifier	40,000	cu. m/day	1		$2,052,901	Additional clarifier
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	56,109	BOD kg/d	1		$20,504,408	
Aerators	56,109	BOD kg/d	1	Systems	$6,396,471	
Nutrient Addition	————		1	Systems	$400,000	
Neutralisation	————		1	Systems	$200,000	
Secondary Clarifier	112,114	cu. m/day	2		$9,297,502	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	Integrate with existing primary solids
Sludge Dewatering	20,000	kg/day	1	Systems	$5,000,000	dewatering system
Submerged Outfall	224,228	cu. m/day	0	km long	——	Exists
Roads	————		0	Kilometres	——	
Site allowances (arbitrary)	2,200,000	Dollars	————	Lump Sums	$2,200,000	
Capital cost (excluding inflation and regional factors)					$51,818,938	
(Regional factor = 1.20)			**Capital Cost =**		$62,183,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	3947	kw	$0.030	$/kW hour	$947,219	Pumping + aeration + misc
Lime for neutralisation	16000	kg/day	$0.09	$/kg Cao	$504,000	
Ammonia	3407	kg/day	$0.40	$/kg NH3	$476,930	For Activated Sludge
Phosphoric Acid	1774	kg/day	$1.03	$/kg H3PO4	$639,448	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	224	kg/day	$14.00	$/kg	$1,099,744	
Operators	48	man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16	man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$1,554,575	2.5% of capital cost
			Annual Operating Cost =		$6,116,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
41 meter dia. Primary Clarifier, 2 x 87 meter dia. Secondary Clarifiers
112200 cu. meter Activated Sludge Reactor with 3200 kW installed aeration
(Company currently proposing an activated sludge system)

NBIP FOREST PRODUCTS INC. DALHOUSIE N.B.

Effluent data ——> 73,934 21,154 28,549 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	75,934	cu. m/day	0.5	km long	$338,331	From ASB to shore
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	75,934	cu. m/day	2	km long	$935,398	From mill to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	75,934	cu. m/day	1		$1,590,951	From mill to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	----------	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Existing unit adequate
Aerated Stabilisation Basin	28,549	BOD kg/d	1		$9,606,421	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	28,549	BOD kg/d	1	Systems	$3,254,597	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	75,934	cu. m/day	1	km long	$7,091,485	
Roads	———		1	Kilometres	$25,000	
Site allowances (arbitrary)	800,000	Dollars	———	Lump Sums	$800,000	
Capital cost (excluding inflation and regional factors)					$23,842,184	
(Regional factor = 1.15)			**Capital Cost =**		$27,419,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1908	kw	$0.044	$/kW hour	$671,612	Pumping + aeration + misc
Lime for neutralisation	9000	kg/day	$0.09	$/kg Cao	$283,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	143	kg/day	$0.37	$/kg	$18,486	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$685,475	2.5% of capital cost
			Annual Operating Cost =		$1,792,000	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.

9.4 day retention Aerated Stabilisation Basin with 1630 kW installed aeration
Submerged Outfall 1000 metres long

DOMTAR INC. **DOLBEAU** **QUEBEC**

Effluent data ——> 67,900 3,641 51,014 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	67,900	cu. m/day	1	km long	$629,223	Secondary clarifier to shore
Gravity Pipeline 2		cu. m/day	0	km long	———	
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1	67,900	cu. m/day	0.5	km long	$215,037	Prim clarifier to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1	67,900	cu. m/day	1		$1,504,438	Prim clarifier to activated sludge reactor
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Primary Clarifier		cu. m/day	0		———	Existing unit adequate
Aerated Stabilisation Basin		BOD kg/d	0		———	
Activated Sludge Reactor	51,014	BOD kg/d	1		$16,331,102	
Aerators	51,014	BOD kg/d	1	Systems	$5,815,608	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	33,950	cu. m/day	2		$5,595,877	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	20,000	kg/day	1	Systems	$2,700,000	
Submerged Outfall	67,900	cu. m/day	0.5	km long	$3,390,636	
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	700,000	Dollars	———	Lump Sums	$700,000	
Capital cost (excluding inflation and regional factors)					$38,581,921	
(Regional factor =	1.05)		**Capital Cost =**		$40,511,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	3231	kw	$0.022	$/kW hour	$568,732	Pumping + aeration + misc
Lime for neutralisation	4000	kg/day	$0.09	$/kg Cao	$126,000	
Ammonia	3097	kg/day	$0.40	$/kg NH3	$433,620	For Activated Sludge
Phosphoric Acid	1613	kg/day	$1.03	$/kg H3PO4	$581,380	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	204	kg/day	$14.00	$/kg	$999,876	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	20	dry t/day	$60.00	$/dry tonne	$420,000	
Maintenance	Total maintenance labour and materials =				$1,012,775	2.5% of capital cost
			Annual Operating Cost =		$4,906,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
2 x 48 meter dia. Secondary Clarifiers
85000 cu. meter Activated Sludge Reactor with 2910 kW installed aeration
Submerged Outfall 500 metres long

DOMTAR INC. — DONNACONA — QUEBEC

Effluent data ——> 46,054 | 15,670 | 22,864 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	46,054	cu. m/day	2	km long	$977,781	ASB to shore, length from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	46,054	cu. m/day	4	km long	$1,285,728	Mill to ASB, length from Beak 1985
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	46,054	cu. m/day	0		------	Mill to ASB
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	0	Dollars	———	Lump Sum	------	
Primary Clarifier	46,054	cu. m/day	1		$2,195,030	
Aerated Stabilisation Basin	22,864	BOD kg/d	1		$8,827,432	Special cost due to site conditions
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	22,864	BOD kg/d	1	Systems	$2,606,471	
Nutrient Addition	———		0	Systems	------	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering	12,000	kg/day	1	Systems	$2,620,000	
Submerged Outfall	46,054	cu. m/day	0.3	km long	$1,741,769	
Roads	———		0	Kilometres	------	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$20,954,211	
(Regional factor = 1.05)			**Capital Cost =**		$22,002,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1489 kw	$0.022	$/kW hour	$262,115	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	—— kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	—— kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	114 kg/day	$0.37	$/kg	$14,804	For aerated Stabilisation basins
Polymer for biosludge	—— kg/day	$14.00	$/kg	——	
Operators	4 man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4 man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33 person	$90,000	$/year	$29,700	
Sludge disposal	——— dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =			$550,050	2.5% of capital cost
		Annual Operating Cost =		$1,149,000	

Description of System

6000 metres of effluent piping,
44 meter dia. Primary Clarifier,
12.4 day retention Aerated Stabilisation Basin with 1300 kW installed aeration
Submerged Outfall 300 metres long

CASCADES (EAST ANGUS) INC. EAST ANGUS QUEBEC

Effluent data ——>	37 930	5 702	6 134	Flow cu. m/day	TSS kg/d	BOD kg/d

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	37 930	cu. m/day	2	km long	$861 903	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	37 930	cu. m/day	4	km long	$1 111 572	Mill to ASB
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	37 930	cu. m/day	1		$1 124 426	Mill to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	1 200 000	Dollars	———	Lump Sum	$1 200 000	Collection system, Beak 1985 + inflation
Primary Clarifier	37 930	cu. m/day	1		$2 001 734	
Aerated Stabilisation Basin	6,134	BOD kg/d	1		$2,764,455	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	6,134	BOD kg/d	1	Systems	$699,287	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary Sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	0	Systems	——	
Submerged Outfall	37,930	cu. m/day	0.2	km long	$1,074,450	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	400,000	Dollars	———	Lump Sums	$400,000	
Capital cost (excluding inflation and regional factors)					$11,437,827	
(Regional factor = 1.05)			**Capital Cost =**		$12,010,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	467	kw	$0.022	$/kW hour	$82,138	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	31	kg/day	$0.37	$/kg	$3,972	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$300,250	2.5% of capital cost
			Annual Operating Cost =		$520,000	

Description of System

6000 metres of effluent piping, 1 Effluent Pump Stations.
40 meter dia. Primary Clarifier,
4 day retention Aerated Stabilisation Basin with 350 kW installed aeration
Submerged Outfall 200 metres long

FRASER INC. **EDMUNSTON** **N.B.**

Effluent data ——> 120.834 9,476 15.863 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	120.834	cu. m/day	0.2	km long	$183,038	To connect to new cell for ASB
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	120.834	cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	120.834	cu. m/day	0		——	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	100,000	Dollars	——	Lump Sum	$100,000	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	15,863	BOD kg/d	1		$5,968,326	Additional cell for existing ASB
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	15,863	BOD kg/d	1	Systems	$1,808,426	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	120.834	cu. m/day	0	km long	——	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$8,059,790	
(Regional factor = 1.15)			**Capital Cost =**		$9,269,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1267	kw	$0.044	$/kW hour	$445,848	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	79	kg/day	$0.37	$/kg	$10,272	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	No additional labour, since there is an
Technicians		man hrs/d	$50.88	$/man hour	——	existing system that requires only realtiv
Process Engineer		person	$90,000	$/year	——	simple expansion
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$231,725	2.5% of capital cost
			Annual Operating Cost =		$688,000	

Description of System

200 metres of effluent piping.

3.3 day retention Aerated Stabilisation Basin with 900 kW installed aeration
(Addtional cell for existing ASB)

BOISE CASCADE CANADA LTD. **FORT FRANCES** **ONTARIO**

Effluent data ——> 92,259 4,510 12,101 (Flow cu. m/day ; TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	92,259	cu. m/day	0.2	km long	$153,594	To extend existing ASB
Gravity Pipeline 2	92,259	cu. m/day	0.3	km long	$230,391	To extend existing ASB
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	15,000	BOD kg/d	1		$5,703,819	Nominal capacity for ASB extension
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)	250,000	Dollars	----------	Lump Sums	$250,000	
Capital cost (excluding inflation and regional factors)					$7,477,804	
(Regional factor = 1.05)			**Capital Cost =**		$7,852,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.038	$/kW hour	$181,944	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	61	kg/day	$0.37	$/kg	$7,835	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	No additional labour
Technicians		man hrs/d	$50.88	$/man hour	——	No additional labour
Process Engineer		person	$90,000	$/year	——	No additional labour
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$196,300	2.5% of capital cost
			Annual Operating Cost =		$386,000	

Description of System

500 metres of effluent piping.

3.3 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Additional cell for existing ASB)

CPFP INC. **GATINEAU** **QUEBEC**

Effluent data ——> 191,270 13,937 37,902 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	191,270	cu. m/day	0.2	km long	$246,712	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	191,270	cu. m/day	3	km long	$2,805,414	Mill to ASB
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	191,270	cu. m/day	1		$2,525,008	Mill to ASB
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Bridge for road and pipe	2,000,000	Dollars	------	Lump Sum	$2,000,000	
Primary Clarifier		cu. m/day	0		------	Existing unit is adequate
Aerated Stabilisation Basin	37,902	BOD kg/d	1		$15,710,594	High cost due to water table
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	37,902	BOD kg/d	1	Systems	$4,320,842	
Nutrient Addition	------		0	Systems	------	
Neutralisation	------		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall	191,270	cu. m/day	0.2	km long	$2,052,353	
Roads	------		0	Kilometres	------	
Site allowances (arbitrary)	1,900,000	Dollars	------	Lump Sums	$1,900,000	
Capital cost (excluding inflation and regional factors)					$31,760,922	
(Regional factor = 1.05)			**Capital Cost =**		$33,349,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2771	kw	$0.022	$/kW hour	$487,613	Pumping + aeration + misc
Lime for neutralisation	14000	kg/day	$0.09	$/kg Cao	$441,000	
Ammonia	----	kg/day	$0.40	$/kg NH3	----	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	190	kg/day	$0.37	$/kg	$24,542	For aerated Stabilisation basins
Polymer for biosludge	----	kg/day	$14.00	$/kg	----	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	----	
Maintenance	Total maintenance labour and materials			=	$833,725	2.5% of capital cost
			Annual Operating Cost =		$1,920,000	

Description of System

3200 metres of effluent piping, 1 Effluent Pump Stations.

5 day retention Aerated Stabilisation Basin with 2160 kW installed aeration
Submerged Outfall 200 metres long

CPFP INC. **GOLD RIVER** **B.C.**

Effluent data ——> 170,625 6,780 17,213 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	170,625	cu. m/day	0.5	km long	$572,647	Miscellaneous collection
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	170,625	cu. m/day	0.5	km long	$429,183	to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	170,625	cu. m/day	1		$2,384,848	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Existing system is adequate for feed to
Aerated Stabilisation Basin		BOD kg/d	0		——	activated sludge system
Activated Sludge Reactor	17,213	BOD kg/d	1		$9,343,644	
Aerators	17,213	BOD kg/d	1	Systems	$1,962,335	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	85,313	cu. m/day	2		$8,278,309	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	0	kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	Existing outfall is adequate
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	500,000	Dollars	——	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$24,070,966	
(Regional factor =	1.20)		**Capital Cost =**		$28,885,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1478	kw	$0.030	$/kW hour	$354,748	Pumping + aeration + misc
Lime for neutralisation	13000	kg/day	$0.09	$/kg Cao	$409,500	
Ammonia	1045	kg/day	$0.40	$/kg NH3	$146,314	For Activated Sludge
Phosphoric Acid	544	kg/day	$1.03	$/kg H3PO4	$196,172	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	69	kg/day	$14.00	$/kg	$337,384	
Operators	48	man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16	man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	6	dry t/day	$60.00	$/dry tonne	$126,000	
Maintenance	Total maintenance labour and materials =				$722,125	2.5% of capital cost
			Annual Operating Cost =		$3,186,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.
2 x 76 meter dia. Secondary Clarifiers
43000 cu. meter Activated Sludge Reactor with 980 kW installed aeration

ABITIBI PRICE INC. **GRAND FALLS** **NFLD.**

Effluent data ——> 157,023 12,295 32,212 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	157,023	cu. m/day	0.5	km long	$542,544	
Gravity Pipeline 2	157,023	cu. m/day	2	km long	$2,170,175	ASB to shore
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	157,023	cu. m/day	0.1	km long	$80,651	To primary clarifier
Forcemain 2	157,023	cu. m/day	4	km long	$3,226,056	Mill to ASB
Pump Station 1	157,023	cu. m/day	1		$2,287,812	To primary clarifier
Pump Station 2	157,023	cu. m/day	1		$2,287,812	Mill to ASB
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	1,000,000	Dollars	——	Lump Sum	$1,000,000	Collection of existing outfalls
Primary Clarifier	157,023	cu. m/day	1		$3,930,714	
Aerated Stabilisation Basin	32,212	BOD kg/d	1		$10,593,122	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	32,212	BOD kg/d	1	Systems	$3,672,146	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	1,000	kg/day	1	Systems	$2,510,000	
Submerged Outfall	157,023	cu. m/day	0.1	km long	$948,305	In Exploits river
Roads	——		3	Kilometres	$75,000	
Site allowances (arbitrary)	1,600,000	Dollars	——	Lump Sums	$1,600,000	
Capital cost (excluding inflation and regional factors)					$35,124,336	
(Regional factor = 1.15)			**Capital Cost =**		$40,393,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2752	kw	$0.044	$/kW hour	$968,790	Pumping + aeration + misc
Lime for neutralisation	7000	kg/day	$0.09	$/kg Cao	$220,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	161	kg/day	$0.37	$/kg	$20,857	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$1,009,825	2.5% of capital cost
			Annual Operating Cost =		$2,353,000	

Description of System

6600 metres of effluent piping, 2 Effluent Pump Stations.
81 meter dia. Primary Clarifier,
5.1 day retention Aerated Stabilisation Basin with 1840 kW installed aeration
Submerged Outfall 100 metres long

STONE-CONSOLIDATED INC. GRAND MERE QUEBEC

Effluent data ——>	42,826	5,798	20,362	(Flow cu. m/day | TSS kg/d | BOD kg/d)		
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	42,826	cu. m/day	2	km long	$932,677	ASB to St Maurice river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	42,826	cu. m/day	6	km long	$1,826,309	Mill to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	42,826	cu. m/day	2		$2,389,596	One pump station into primary clarifier
Pump Station 2	0	cu. m/day	0		——	and one from clarifier to ASB
Pump Station 3	10,000	cu. m/day	1		$577,350	Aux pump station
Collection and segregation	2,000,000	Dollars	——	Lump Sum	$2,000,000	
Primary Clarifier	42,826	cu. m/day	1		$2,120,566	
Aerated Stabilisation Basin	20,362	BOD kg/d	1		$12,000,000	Difficult terrain
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	20,362	BOD kg/d	1	Systems	$2,321,312	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall	42,826	cu. m/day	0.1	km long	$563,959	
Roads	——		5	Kilometres	$125,000	
Site allowances (arbitrary)	600,000	Dollars	——	Lump Sums	$600,000	
Capital cost (excluding inflation and regional factors)					$28,206,769	
(Regional factor = 1.05)			**Capital Cost =**		$29,617,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1357	kw	$0.022	$/kW hour	$238,895	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	102	kg/day	$0.37	$/kg	$13,185	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$740,425	2.5% of capital cost
			Annual Operating Cost =		$1,315,000	

Description of System

8000 metres of effluent piping, 3 Effluent Pump Stations.
43 meter dia. Primary Clarifier,
11.9 day retention Aerated Stabilisation Basin with 1160 kW installed aeration
Submerged Outfall 100 metres long

PROCTER & GAMBLE CELLULOSE GRANDE PRAIRIE ALBERTA

Effluent data ——> 69,750 3,353 6,470 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	69,750	cu. m/day	0.5	km long	$320,157	For ASB extension
Gravity Pipeline 2		cu. m/day	0	km long	—	
Gravity Pipeline 3		cu. m/day	0	km long	—	
Forcemain 1		cu. m/day	0	km long	—	
Forcemain 2		cu. m/day	0	km long	—	
Pump Station 1		cu. m/day	0		—	
Pump Station 2		cu. m/day	0		—	
Pump Station 3		cu. m/day	0		—	
Lump Sum Piping		Dollars	——	Lump Sum	—	
Primary Clarifier		cu. m/day	0		—	
Aerated Stabilisation Basin	12,000	BOD kg/d	1		$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor		BOD kg/d	0		—	
Aerators	12,000	BOD kg/d	1	Systems	$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition			0	Systems	—	
Neutralisation			0	Systems	—	
Secondary Clarifier		cu. m/day	0		—	
Secondary sludge thickener		Dollars	0		—	
Sludge Dewatering		kg/day	0	Systems	—	
Submerged Outfall		cu. m/day	0	km long	—	
Roads			0	Kilometres	—	
Site allowances (arbitrary)		Dollars	——	Lump Sums	—	
Capital cost (excluding inflation and regional factors)					$6,448,833	
(Regional factor = 1.10)			**Capital Cost =**		$7,094,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	718	kw	$0.039	$/kW hour	$224,078	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	—	
Ammonia	—	kg/day	$0.40	$/kg NH3	—	For Activated Sludge
Phosphoric Acid	—	kg/day	$1.03	$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	32	kg/day	$0.37	$/kg	$4,190	For aerated Stabilisation basins
Polymer for biosludge	—	kg/day	$14.00	$/kg	—	
Operators		man hrs/d	$23.13	$/man hour	—	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	—	No additional labour required
Process Engineer		person	$90,000	$/year	—	No additional labour required
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	—	
Maintenance	Total maintenance labour and materials =				$177,350	2.5% of capital cost
			Annual Operating Cost =		$406,000	

Description of System

500 metres of effluent piping.

2.3 day retention Aerated Stabilisation Basin with 680 kW installed aeration
(Extend existing ASB)

STORA FOREST INDUSTRIES LTD. PORT HAWKESBURY N.S.

Effluent data ——> 104,004 20,196 60,526 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	104,004	cu. m/day	2	km long	$1,660,357	ASB to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	104,004	cu. m/day	3	km long	$1,776,432	Mill to ASB. distance from Beak 1985
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	104,004	cu. m/day	1		$1,861,932	Mill to ASB
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	0	Dollars	------	Lump Sum	------	
Primary Clarifier	104,004	cu. m/day	1		$3,232,122	Existing 2 units are adequate
Aerated Stabilisation Basin	60,526	BOD kg/d	1		$17,656,480	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	60,526	BOD kg/d	1	Systems	$8,899,951	
Nutrient Addition	------		0	Systems	------	
Neutralisation	------		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	
Roads	------		3	Kilometres	$75,000	
Site allowances (arbitrary)	1,000,000	Dollars	------	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$34,362,275	
(Regional factor = 1.15)			**Capital Cost =**		$39,517,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	3895	kw	$0.044	$/kW hour	$1,371,210	Pumping + aeration + misc
Lime for neutralisation	10000	kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	303	kg/day	$0.37	$/kg	$39,191	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$987,925	2.5% of capital cost
			Annual Operating Cost =		$2,847,000	

Description of System

5000 metres of effluent piping, 1 Effluent Pump Stations.

66 meter dia. Primary Clarifier,

14.5 day retention Aerated Stabilisation Basin with 3450 kW installed aeration

WELDWOOD OF CANADA LTD. HINTON ALBERTA

Effluent data ——> 110,375 9,379 4,919 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$0	
(Regional factor = 1.10)			**Capital Cost =**		$0	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.039	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Mill was rebuilt 1988/1990, and will comply with proposed Federal regulations without any additional expenditure

CPFP INC. **HUBBARDS** **N.S.**

Effluent data ——> 4,029 7,472 3,406 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	----	
Gravity Pipeline 2		cu. m/day	0	km long	----	
Gravity Pipeline 3		cu. m/day	0	km long	----	
Forcemain 1		cu. m/day	0	km long	----	
Forcemain 2		cu. m/day	0	km long	----	
Pump Station 1		cu. m/day	0		----	
Pump Station 2		cu. m/day	0		----	
Pump Station 3		cu. m/day	0		----	
Lump Sum Piping		Dollars	----	Lump Sum	----	
Primary Clarifier		cu. m/day	0		----	
Aerated Stabilisation Basin		BOD kg/d	0		----	
Activated Sludge Reactor		BOD kg/d	0		----	
Aerators		BOD kg/d	0	Systems	----	
Nutrient Addition			0	Systems	----	
Neutralisation			0	Systems	----	
Secondary Clarifier		cu. m/day	0		----	
Secondary sludge thickener		Dollars	0		----	
Sludge Dewatering		kg/day	0	Systems	----	
Submerged Outfall		cu. m/day	0	km long	----	
Roads			0	Kilometres	----	
Site allowances (arbitrary)	100,000	Dollars	----	Lump Sums	$100,000	Allowance to upgrade existing system
Capital cost (excluding inflation and regional factors)					$100,000	
(Regional factor = 1.15)			**Capital Cost =**		$115,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	50	kw	$0.044	$/kW hour	$17,600	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	----	
Ammonia	----	kg/day	$0.40	$/kg NH3	----	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	----	kg/day	$14.00	$/kg	----	
Operators		man hrs/d	$23.13	$/man hour	----	Inc Fringes and Overhead
Technicians	8	man hrs/d	$50.88	$/man hour	$142,450	Additional labour required to optimise
Process Engineer	0.33	person	$90,000	$/year	$29,700	system
Sludge disposal	----	dry t/day	$60.00	$/dry tonne	----	
Maintenance	Total maintenance labour and materials =				$2,875	2.5% of capital cost
			Annual Operating Cost =		$193,000	

Description of System

Minor upgrades to existing system

E.B. EDDY FOREST PRODUCTS LTD. HULL QUEBEC

Effluent data ——> 45,975 2,044 3,611 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping	50,000	Dollars	------	Lump Sum	$50,000	
Primary Clarifier		cu. m/day	0		------	Add polymer to existing clarifier
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators		BOD kg/d	0	Systems	------	
Polymer system			1	Systems	$100,000	
Neutralisation			0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	
Roads			0	Kilometres	------	
Site allowances (arbitrary)	100,000	Dollars	------	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$250,000	
(Regional factor = 1.05)			**Capital Cost =**		$263,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	50 kw	$0.022	$/kW hour	$8,800	Misc addition
Lime for neutralisation	kg/day	$0.09	$/kg Cao	------	
Ammonia	------ kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------ kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer	50 kg/day	$8.00	$/kg	$140,000	
Operators	man hrs/d	$23.13	$/man hour	------	Inc Fringes and Overhead
Technicians	man hrs/d	$50.88	$/man hour	------	Inc Fringes, Equipment, Materials & Oh
Process Engineer	person	$90,000	$/year	------	
Sludge disposal	------ dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials		=	$6,575	2.5% of capital cost
		Annual Operating Cost =		$155,000	

Description of System

Improve existing clarifier by polymer addition

ABITIBI PRICE INC. — IROQUOIS FALLS — ONTARIO

Effluent data ——> 67,788 | 6,209 | 52,738 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	67,788	cu. m/day	0.5	km long	$314,273	Secondary clarifiers to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	67,788	cu. m/day	0.3	km long	$128,862	Primary clarifier to activated sludge
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	67,788	cu. m/day	1		$1,503,191	Primary clarifier to activated sludge
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	————	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	52,738	BOD kg/d	1		$16,782,263	
Aerators	52,738	BOD kg/d	1	Systems	$6,012,127	
Nutrient Addition	————		1	Systems	$400,000	
Neutralisation	————		1	Systems	$200,000	
Secondary Clarifier	33,894	cu. m/day	2		$5,591,935	
Secondary sludge thickene	1,200,000	Dollars	1		$1,200,000	
Sludge Dewatering	20,000	kg/day	1	Systems	$2,700,000	
Submerged Outfall	67,788	cu. m/day	0.1	km long	$677,678	
Roads	————		0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	————	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$36,510,328	
(Regional factor = 1.05)			**Capital Cost =**		$38,336,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	3334	kw	$0.038	$/kW hour	$1,013,630	Pumping + aeration + misc
Lime for neutralisation	8000	kg/day	$0.09	$/kg Cao	$252,000	
Ammonia	3202	kg/day	$0.40	$/kg NH3	$448,273	For Activated Sludge
Phosphoric Acid	1667	kg/day	$1.03	$/kg H3PO4	$601,026	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	211	kg/day	$14.00	$/kg	$1,033,664	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	20	dry t/day	$60.00	$/dry tonne	$420,000	
Maintenance	Total maintenance labour and materials			=	$958,400	2.5% of capital cost
			Annual Operating Cost =		$5,490,000	

Description of System

800 metres of effluent piping, 1 Effluent Pump Stations.
2 x 48 meter dia. Secondary Clarifiers
87900 cu. meter Activated Sludge Reactor with 3010 kW installed aeration
Submerged Outfall 100 metres long

CASCADES INC. **JOLIETTE** **QUEBEC**

Effluent data ——> 2,834 616 780 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	
Gravity Pipeline 2		cu. m/day	0	km long	
Gravity Pipeline 3		cu. m/day	0	km long	
Forcemain 1		cu. m/day	0	km long	
Forcemain 2		cu. m/day	0	km long	
Pump Station 1		cu. m/day	0		
Pump Station 2	0	cu. m/day	0		
Pump Station 3	0	cu. m/day	0		
Lump Sum Piping	0	Dollars	——	Lump Sum	
Primary Clarifier		cu. m/day	0		
Aerated Stabilisation Basin		BOD kg/d	0		
Activated Sludge Reactor		BOD kg/d	0		
Aerators		BOD kg/d	0	Systems	
Nutrient Addition			0	Systems	
Neutralisation			0	Systems	
Secondary Clarifier		cu. m/day	0		
Secondary sludge thickener		Dollars	0		
Sludge Dewatering		kg/day	0	Systems	
Submerged Outfall		cu. m/day	0	km long	
Roads			0	Kilometres	
Site allowances (arbitrary)		Dollars	——	Lump Sums	
Capital cost (excluding inflation and regional factors)					$0
(Regional factor = 1.05)			**Capital Cost =**		$0
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.022	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Municipal discharge, no effluent treatment required

ABITIBI PRICE INC. **JONQUIERE** **QUEBEC**

Effluent data ——> 119,799 7,161 14,000 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	119,799	cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	119,799	cu. m/day	0.5	km long	$329,192	From clarifiers to act sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	119,799	cu. m/day	1		$1,998,322	From clarifiers to act sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	14,000	BOD kg/d	1		$5,656,326	
Aerators	14,000	BOD kg/d	1	Systems	$1,596,000	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	59,899	cu. m/day	2		$7,123,046	
Secondary sludge thickene	1,100,000	Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	Extension to existing system
Submerged Outfall	119,799	cu. m/day	0.5	km long	$4,255,143	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,200,000	Dollars	———	Lump Sums	$1,200,000	
Capital cost (excluding inflation and regional factors)					$25,308,030	
(Regional factor =	1.05)		**Capital Cost =**		$26,573,000	**BOD estim. from production**
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1152	kw	$0.022	$/kW hour	$202,817	Pumping + aeration + misc
Lime for neutralisation	8000	kg/day	$0.09	$/kg Cao	$252,000	
Ammonia	850	kg/day	$0.40	$/kg NH3	$119,000	For Activated Sludge
Phosphoric Acid	443	kg/day	$1.03	$/kg H3PO4	$159,550	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	56	kg/day	$14.00	$/kg	$274,400	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$664,325	2.5% of capital cost
			Annual Operating Cost =		$2,435,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.
2 x 64 meter dia. Secondary Clarifiers
23300 cu. meter Activated Sludge Reactor with 800 kW installed aeration
Submerged Outfall 500 metres long

CASCADES (JONQUIERE) INC. — JONQUIERE — QUEBEC

Effluent data ——> 46,683 5,287 13,200 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	46,683	cu. m/day	5	km long	$2,466,095	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	46,683	cu. m/day	3	km long	$974,153	Mill to primary clarifier
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	46,683	cu. m/day	1		$1,247,431	Mill to primary clarifier
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	600,000	Dollars	——	Lump Sum	$600,000	Collection of existing outfalls
Primary Clarifier	46,683	cu. m/day	1		$2,209,214	
Aerated Stabilisation Basin	13,200	BOD kg/d	1		$5,142,765	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	13,200	BOD kg/d	1	Systems	$1,504,800	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall	46,683	cu. m/day	0.1	km long	$583,747	
Roads	——		3	Kilometres	$75,000	
Site allowances (arbitrary)	500,000	Dollars	——	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$18,053,204	
(Regional factor = 1.05)			**Capital Cost =**		$18,956,000	BOD estim. from production
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	913	kw	$0.022	$/kW hour	$160,611	Pumping + aeration + misc
Lime for neutralisation	3000	kg/day	$0.09	$/kg Cao	$94,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	68	kg/day	$0.37	$/kg	$8,547	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	16	man hrs/d	$23.13	$/man hour	$129,500	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	Extra operator time due to distance fro
Sludge disposal	5	dry t/day	$60.00	$/dry tonne	$105,000	mill
Maintenance	Total maintenance labour and materials			=	$568,680	3% of capital cost
			Annual Operating Cost =		$1,168,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.
44 meter dia. Primary Clarifier,
7.1 day retention Aerated Stabilisation Basin with 750 kW installed aeration
Submerged Outfall 100 metres long

WEYERHAEUSER CANADA LTD. KAMLOOPS B.C.

Effluent data ——> 178,608 12,943 3,510 Flow cu. m/day TSS kg/d BOD kg/d

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	.....	
Gravity Pipeline 2		cu. m/day	0	km long	.....	
Gravity Pipeline 3		cu. m/day	0	km long	.....	
Forcemain 1		cu. m/day	0	km long	.....	
Forcemain 2		cu. m/day	0	km long	.....	
Pump Station 1		cu. m/day	0		—	
Pump Station 2	0	cu. m/day	0		—	
Pump Station 3	0	cu. m/day	0		—	
Lump Sum Piping	0	Dollars	———	Lump Sum	—	
Primary Clarifier		cu. m/day	0		—	
Aerated Stabilisation Basin	5,000	BOD kg/d	1		$2,342,596	Nominal BOD load for additional cell
Activated Sludge Reactor		BOD kg/d	0		—	
Aerators	5,000	BOD kg/d	1	Systems	$500,000	Additional HP
Nutrient Addition	———		0	Systems	—	
Neutralisation	———		0	Systems	—	
Secondary Clarifier		cu. m/day	0		—	
Secondary sludge thickener		Dollars	0		—	
Sludge Dewatering		kg/day	0	Systems	—	
Submerged Outfall		cu. m/day	0	km long	—	
Roads			0	Kilometres	—	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	-----	
Capital cost (excluding inflation and regional factors)					$2,842,596	
(Regional factor = 1.20)			**Capital Cost =**		$3,411,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	300	kw	$0.030	$/kW hour	$72,000	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	—	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	—	kg/day	$1.03	$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	500	kg/day	$0.37	$/kg	$64,750	For aerated Stabilisation basins
Polymer for biosludge	—	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$27.61	$/man hour	—	Inc Fringes and Overhead
Technicians		man hrs/d	$60.75	$/man hour	—	Inc Fringes, Equipment, Materials & Ch
Process Engineer		person	$90,000	$/year	—	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	—	
Maintenance	Total maintenance labour and materials			=	$85,275	2.5% of capital cost
			Annual Operating Cost =		$222,000	In addition to current costs

Description of System

Upgrade existing ASB by adding one cell and 300 kW aeration. Assume additional nutrients used
(Note that measures to reduce AOX may improve raw effluent and make upgrade unnecessary)

SPRUCE FALLS POWER & PAPER CO. KAPUSKASING ONTARIO

Effluent data ——> 107,553 7,081 29,085 (Flow cu. m/day | TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	107,553	cu. m/day	1.5	km long	$1,272,724	To river
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	107,553	cu. m/day	1	km long	$607,234	Mill to activated sludge reactors
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	107,553	cu. m/day	1		$1,893,432	to activated sludge reactor
Pump Station 2	0	cu. m/day	0		-------	
Pump Station 3	0	cu. m/day	0		-------	
Lump Sum Piping	1,000,000	Dollars	-------	Lump Sum	$1,000,000	Cross railroad tracks etc
Primary Clarifier		cu. m/day	0		-------	2 units exist
Aerated Stabilisation Basin		BOD kg/d	0		-------	
Activated Sludge Reactor	29,085	BOD kg/d	1		$10,302,028	Mill has selected activated sludge
Aerators	29,085	BOD kg/d	1	Systems	$3,315,733	
Nutrient Addition	-------		1	Systems	$400,000	
Neutralisation	-------		1	Systems	$200,000	
Secondary Clarifier	53,776	cu. m/day	2		$6,803,967	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering	10,000	kg/day	1	Systems	$2,600,000	Addition to existing system
Submerged Outfall	107,553	cu. m/day	0	km long	-------	
Roads	-------		0	Kilometres	-------	
Site allowances (arbitrary)	2,000,000	Dollars	----------	Lump Sums	$2,000,000	Low labour productivity
Capital cost (excluding inflation and regional factors)					$30,395,118	
(Regional factor = 1.05)			**Capital Cost =**		$31,915,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	2023 kw	$0.038	$/kW hour	$615,018	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	1766 kg/day	$0.40	$/kg NH3	$247,226	For Activated Sludge
Phosphoric Acid	919 kg/day	$1.03	$/kg H3PO4	$331,470	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	116 kg/day	$14.00	$/kg	$570,073	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	10 dry t/day	$60.00	$/dry tonne	$210,000	
Maintenance	Total maintenance labour and materials =			$797,875	2.5% of capital cost
			Annual Operating Cost =	$3,850,000	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.
2 x 60 meter dia. Secondary Clarifiers
48500 cu. meter Activated Sludge Reactor with 1660 kW installed aeration

BOISE CASCADE CANADA LTD. KENORA ONTARIO

Effluent data ——>	61,000	3,360	28,702 (Flow cu. m/day | TSS kg/d | BOD kg/d)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	61,000	cu. m/day	0.3	km long	$176,066	Secondary clarifiers tonewoutfall
Gravity Pipeline 2	61,000	cu. m/day	0.7	km long	$410,820	Clarifier to activated sludge reactors
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	200,000	Dollars	------	Lump Sum	$200,000	Extra long secondary sludge line
Primary Clarifier		cu. m/day	0		------	Existing one is adequate
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	28,702	BOD kg/d	1		$10,190,431	
Aerators	28,702	BOD kg/d	1	Systems	$3,271,983	
Nutrient Addition	------		1	Systems	$400,000	
Neutralisation	------		1	Systems	$200,000	
Secondary Clarifier	30,500	cu. m/day	2		$5,346,735	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	12,000	kg/day	1	Systems	$2,620,000	Addition to existing system
Submerged Outfall	61,000	cu. m/day	0.5	km long	$3,248,368	New location, abandon existing one
Roads	------		0	Kilometres	------	
Site allowances (arbitrary)	600,000	Dollars	------	Lump Sums	$600,000	
Capital cost (excluding inflation and regional factors)					$27,764,404	
(Regional factor = 1.05)			**Capital Cost =**		$29,153,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1718	kw	$0.038	$/kW hour	$522,209	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	1743	kg/day	$0.40	$/kg NH3	$243,964	For Activated Sludge
Phosphoric Acid	907	kg/day	$1.03	$/kg H3PO4	$327,096	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	115	kg/day	$14.00	$/kg	$562,552	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	10	dry t/day	$60.00	$/dry tonne	$210,000	
Maintenance	Total maintenance labour and materials =				$728,825	2.5% of capital cost
			Annual Operating Cost =		$3,547,000	

Description of System

1000 metres of effluent piping,
2 x 45 meter dia. Secondary Clarifiers
47800 cu. meter Activated Sludge Reactor with 1640 kW installed aeration
Submerged Outfall 500 metres long

CASCADES PAPER INC. — KINGSEY FALLS — QUEBEC

Effluent data ——> 5,594 | 862 | 3,549 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	----	
Gravity Pipeline 3		cu. m/day	0	km long	----	
Forcemain 1		cu. m/day	0	km long	----	
Forcemain 2		cu. m/day	0	km long	----	
Pump Station 1		cu. m/day	0		----	
Pump Station 2		cu. m/day	0		----	
Pump Station 3		cu. m/day	0		----	
Lump Sum Piping		Dollars	------	Lump Sum	----	
Primary Clarifier		cu. m/day	0		----	
Aerated Stabilisation Basin		BOD kg/d	0		----	
Activated Sludge Reactor		BOD kg/d	0		----	
Aerators		BOD kg/d	0	Systems	----	
Nutrient Addition	------		0	Systems	----	
Neutralisation	------		0	Systems	----	
Secondary Clarifier		cu. m/day	0		----	
Secondary sludge thickene	1,100,000	Dollars	0		----	
Sludge Dewatering	0	kg/day	0	Systems	----	
Submerged Outfall	5,594	cu. m/day	0	km long	----	
Roads	------		0	Kilometres	----	
Site allowances (arbitrary)	100,000	Dollars	------	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$100,000	
(Regional factor = 1.05)			**Capital Cost =**		$105,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	#VALUE!	kw	$0.022	$/kW hour	----	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	----	
Ammonia	----	kg/day	$0.40	$/kg NH3	----	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$23.13	$/man hour	------	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	------	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	----	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	----	
Maintenance	Total maintenance labour and materials			=	$2,625	2.5% of capital cost
			Annual Operating Cost =		$3,000	

Description of System

No treatment required, discharge to municipal sewer

EUROCAN PULP & PAPER CO. KITIMAT B.C.

Effluent data ——> 90,298 5,524 9,336 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	90,298	cu. m/day	0.5	km long	$378,659	For ASB extension
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1		cu. m/day	0	km long	-------	
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1		cu. m/day	0		-------	
Pump Station 2		cu. m/day	0		-------	
Pump Station 3		cu. m/day	0		-------	
Lump Sum Piping		Dollars	———	Lump Sum	-------	
Primary Clarifier		cu. m/day	0		-------	
Aerated Stabilisation Basin	12,000	BOD kg/d	1		$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor		BOD kg/d	0		-------	
Aerators	12,000	BOD kg/d	1	Systems	$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition			0	Systems	-------	
Neutralisation			0	Systems	-------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering		kg/day	0	Systems	-------	
Submerged Outfall		cu. m/day	0	km long	-------	
Roads			0	Kilometres	-------	
Site allowances (arbitrary)		Dollars	———	Lump Sums	-------	
Capital cost (excluding inflation and regional factors)					$6,507,335	
(Regional factor = 1.20)			**Capital Cost =**		$7,809,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	718	kw	$0.030	$/kW hour	$172,368	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	-------	
Ammonia	-----	kg/day	$0.40	$/kg NH3	-------	For Activated Sludge
Phosphoric Acid	-----	kg/day	$1.03	$/kg H3PO4	-------	For Activated Sludge
Fertiliser for Nutrient	47	kg/day	$0.37	$/kg	$6,045	For aerated Stabilisation basins
Polymer for biosludge	-----	kg/day	$14.00	$/kg	-------	
Operators		man hrs/d	$27.61	$/man hour	-------	No additional labour required
Technicians		man hrs/d	$60.75	$/man hour	-------	No additional labour required
Process Engineer		person	$90,000	$/year	-------	No additional labour required
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	-------	
Maintenance	Total maintenance labour and materials =				$195,225	2.5% of capital cost
			Annual Operating Cost =		$374,000	

Description of System

500 metres of effluent piping.

2.6 day retention Aerated Stabilisation Basin with 680 kW installed aeration (Extend existing ASB) Note that in-plant measures probably more economic

ABITIBI PRICE INC. — LACHUTE — QUEBEC

Effluent data ——> 1,818 337 255 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------
Gravity Pipeline 2		cu. m/day	0	km long	-------
Gravity Pipeline 3		cu. m/day	0	km long	-------
Forcemain 1		cu. m/day	0	km long	-------
Forcemain 2		cu. m/day	0	km long	-------
Pump Station 1		cu. m/day	0		------
Pump Station 2		cu. m/day	0		------
Pump Station 3		cu. m/day	0		------
Lump Sum Piping		Dollars	----------	Lump Sum	------
Primary Clarifier		cu. m/day	0		------
Aerated Stabilisation Basin		BOD kg/d	0		------
Activated Sludge Reactor		BOD kg/d	0		------
Aerators		BOD kg/d	0	Systems	------
Nutrient Addition	-------		0	Systems	------
Neutralisation	-------		0	Systems	------
Secondary Clarifier		cu. m/day	0		------
Secondary sludge thickene	1,100,000	Dollars	0		------
Sludge Dewatering	0	kg/day	0	Systems	------
Submerged Outfall	1,818	cu. m/day	0	km long	------
Roads	-------		0	Kilometres	------
Site allowances (arbitrary)	0	Dollars	----------	Lump Sums	------
Capital cost (excluding inflation and regional factors)					$0
(Regional factor = 1.05)			**Capital Cost =**		$0
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	#VALUE!	kw	$0.022	$/kW hour	------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$23.13	$/man hour	------	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	------	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	------	
Sludge disposal	-------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

No treatment required, discharge to municipal sewer

CPFP INC. **LA TUQUE** **QUEBEC**

Effluent data ——>	301,008	11,253	49,223	(Flow cu. m/day	TSS kg/d	BOD kg/d)	
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**				**COMMENTS**
Gravity Pipeline 1	301,008	cu. m/day	0.5	km long		$828,199	ASB to St Maurice River
Gravity Pipeline 2	100,000	cu. m/day	0.5	km long		$404,631	Mill collection
Gravity Pipeline 3		cu. m/day	0	km long		------	
Forcemain 1	301,008	cu. m/day	7	km long		$9,197,537	Mill to ASB
Forcemain 2		cu. m/day	0	km long		------	
Pump Station 1	301,008	cu. m/day	1			$3,167,583	Mill to ASB
Pump Station 2	0	cu. m/day	0			——	
Pump Station 3	0	cu. m/day	0			——	
Lump Sum Piping	100,000	Dollars	———	Lump Sum		$100,000	Bleach plant collection
Primary Clarifier	50,000	cu. m/day	1			$2,282,445	Add to existing equipment
Aerated Stabilisation Basin	49,223	BOD kg/d	1			$14,934,345	
Activated Sludge Reactor		BOD kg/d	0			——	
Aerators	49,223	BOD kg/d	1	Systems		$5,611,394	
Nutrient Addition	———		0	Systems		——	
Neutralisation	———		1	Systems		$200,000	
Secondary Clarifier		cu. m/day	0			——	
Secondary sludge thickener		Dollars	0			——	
Sludge Dewatering	10,000	kg/day	1	Systems		$2,600,000	Add to existing equipment
Submerged Outfall	301,008	cu. m/day	0.1	km long		$1,230,252	
Roads	———		0	Kilometres		——	
Site allowances (arbitrary)	3,000,000	Dollars	----------	Lump Sums		$3,000,000	
Capital cost (excluding inflation and regional factors)						$43,556,387	
(Regional factor =	1.05)		**Capital Cost =**			$45,734,000	
(Inflation factor =	1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	3736	kw	$0.022	$/kW hour	$657,558	Pumping + aeration + misc
Lime for neutralisation	12000	kg/day	$0.09	$/kg Cao	$378,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	246	kg/day	$0.37	$/kg	$31,872	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	10	dry t/day	$60.00	$/dry tonne	$210,000	In addition to existing
Maintenance	Total maintenance labour and materials			=	$1,143,350	2.5% of capital cost
			Annual Operating Cost	=	$2,554,000	

Description of System

8000 metres of effluent piping, 1 Effluent Pump Stations.
46 meter dia. Primary Clarifier,
4.1 day retention Aerated Stabilisation Basin with 2810 kW installed aeration
Submerged Outfall 100 metres long

DOMTAR INC. **LEBEL-SUR-QUEVILLON** **QUEBEC**

Effluent data ——— > 146,988 5,480 31,786 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	146,988	cu. m/day	1	km long	$1,039,494	ASB to river, length from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1	146,988	cu. m/day	5	km long	$3,837,698	Mill to ASB
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1	146,988	cu. m/day	1		$2,213,500	Mill to ASB
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	500,000	Dollars	———	Lump Sum	$500,000	Allowance for pump station location
Primary Clarifier		cu. m/day	0		———	Use existing settling basins
Aerated Stabilisation Basin	31,786	BOD kg/d	1		$10,479,430	
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	31,786	BOD kg/d	1	Systems	$3,623,550	
Nutrient Addition	———		0	Systems	———	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering	0	kg/day	0	Systems	———	
Submerged Outfall	146,988	cu. m/day	0.2	km long	$1,847,164	
Roads	———		5	Kilometres	$125,000	
Site allowances (arbitrary)	1,500,000	Dollars	----------	Lump Sums	$1,500,000	
Capital cost (excluding inflation and regional factors)					$25,365,836	
(Regional factor = 1.05)			**Capital Cost =**		$26,634,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2288	kw	$0.022	$/kW hour	$402,724	Pumping + aeration + misc
Lime for neutralisation	14000	kg/day	$0.09	$/kg Cao	$441,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	159	kg/day	$0.37	$/kg	$20,581	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	———	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials =				$665,850	2.5% of capital cost
			Annual Operating Cost =		$1,663,000	

Description of System

6000 metres of effluent piping, 1 Effluent Pump Stations.

5.4 day retention Aerated Stabilisation Basin with 1810 kW installed aeration
Submerged Outfall 200 metres long

BOWATER MERSEY PAPER CO. LIVERPOOL N.S.

Effluent data ——> 49,806 6,161 38,960 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	49,806	cu. m/day	0.5	km long	$257,214	Secondary clarifier to shore
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	49,806	cu. m/day	0.3	km long	$102,264	Primary clarifier to activated sludge
Forcemain 2	49,806	cu. m/day	0.3	km long	$102,264	To primary clarifier
Pump Station 1	49,806	cu. m/day	2		$2,576,981	One into clarifier, one to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	300,000	Dollars	----------	Lump Sum	$300,000	Effluent collection
Primary Clarifier	49,806	cu. m/day	1		$2,278,239	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	38,960	BOD kg/d	1		$10,341,042	
Aerators	38,960	BOD kg/d	1	Systems	$4,441,404	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	24,903	cu. m/day	2		$4,905,340	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	21,000	kg/day	1	Systems	$2,710,000	
Submerged Outfall	49,806	cu. m/day	0.5	km long	$2,995,345	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	2,000,000	Dollars	----------	Lump Sums	$2,000,000	
Capital cost (excluding inflation and regional factors)					$33,610,094	
(Regional factor = 1.15)			**Capital Cost =**		$38,652,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2462	kw	$0.044	$/kW hour	$866,792	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	2365	kg/day	$0.40	$/kg NH3	$331,157	For Activated Sludge
Phosphoric Acid	1232	kg/day	$1.03	$/kg H3PO4	$444,002	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	156	kg/day	$14.00	$/kg	$763,610	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	21	dry t/day	$60.00	$/dry tonne	$441,000	
Maintenance	Total maintenance labour and materials =				$966,300	2.5% of capital cost
			Annual Operating Cost =		$4,765,000	

Description of System

1100 metres of effluent piping, 2 Effluent Pump Stations.
46 meter dia. Primary Clarifier, 2 x 41 meter dia. Secondary Clarifiers
48700 cu. meter Activated Sludge Reactor with 2220 kW installed aeration
Submerged Outfall 500 metres long

F.F. SOUCY INC. **RIVIERE-DU-LOUP** **QUEBEC**

Effluent data ——> 20,364 3,793 16,855 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	20,364	cu. m/day	2	km long	$575,277	Secondary clarifier to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	20,364	cu. m/day	0.5	km long	$87,147	Clarifier to activated sludge
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	20,364	cu. m/day	1		$823,888	Clarifier to activated sludge
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Use existing clarifier
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	16,855	BOD kg/d	1		$6,585,982	
Aerators	16,855	BOD kg/d	1	Systems	$1,921,435	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	10,182	cu. m/day	2		$3,354,193	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	7,000	kg/day	1	Systems	$2,570,000	Add to existing
Submerged Outfall	20,364	cu. m/day	0.5	km long	$2,094,481	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	2,000,000	Dollars	——	Lump Sums	$2,000,000	
Capital cost (excluding inflation and regional factors)					$20,612,404	
(Regional factor = 1.05)			**Capital Cost =**		$21,643,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1062 kw	$0.022	$/kW hour	$186,949	Pumping + aeration + misc
Lime for neutralisation	5000 kg/day	$0.09	$/kg Cao	$157,500	
Ammonia	1023 kg/day	$0.40	$/kg NH3	$143,265	For Activated Sludge
Phosphoric Acid	533 kg/day	$1.03	$/kg H3PO4	$192,084	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	67 kg/day	$14.00	$/kg	$330,352	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	7 dry t/day	$60.00	$/dry tonne	$147,000	
Maintenance	Total maintenance labour and materials =			$541,075	2.5% of capital cost
		Annual Operating Cost =		$2,462,000	

Description of System

2500 metres of effluent piping, 1 Effluent Pump Stations.
2 x 28 meter dia. Secondary Clarifiers
28100 cu. meter Activated Sludge Reactor with 960 kW installed aeration
Submerged Outfall 500 metres long

ST. RAYMOND PAPER (1983) INC. RIVIERE-DU-LOUP QUEBEC

Effluent data ——> 4,795 292 833 (Flow cu. m/day | TSS kg/d | BOD kg/d) (estimated bod)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	4,795	cu. m/day	1	km long	$112,358	From ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	4,795	cu. m/day	1	km long	$58,916	To ASB
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	4,795	cu. m/day	1		$399,792	
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	0	Dollars	----------	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	Note reqd
Aerated Stabilisation Basin	833	BOD kg/d	1		$548,776	Small scale
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	833	BOD kg/d	1	Systems	$95,000	
Nutrient Addition	------		0	Systems	------	
Neutralisation	------		0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering	0	kg/day	0	Systems	------	
Submerged Outfall	4,795	cu. m/day	0.1	km long	$234,898	
Roads	------		0	Kilometres	------	
Site allowances (arbitrary)	0	Dollars	------	Lump Sums	------	
Capital cost (excluding inflation and regional factors)					$1,449,738	
(Regional factor = 1.05)			**Capital Cost =**		$1,522,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	62	kw	$0.022	$/kW hour	$10,993	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	4	kg/day	$0.37	$/kg	$540	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$38,050	2.5% of capital cost
			Annual Operating Cost =		$183,000	

Description of System

2000 metres of effluent piping, 1 Effluent Pump Stations.

4.3 day retention Aerated Stabilisation Basin with 50 kW installed aeration
Submerged Outfall 100 metres long

FLETCHER CHALLENGE CANADA LTD MACKENZIE B.C.

Effluent data ——> 77,925 6,201 8,880 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,067	Upgrade existing ASB, by 10t/d nomina
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$5,247,067	
(Regional factor = 1.20)			**Capital Cost =**		$6,296,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.030	$/kW hour	$143,640	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	44	kg/day	$0.37	$/kg	$5,750	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$27.61	$/man hour	——	No additional labour required
Technicians		man hrs/d	$60.75	$/man hour	——	
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$157,400	2.5% of capital cost
	Annual Operating Cost =				$307,000	

Description of System

2.8 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Addition to existing ASB)

JAMES RIVER MARATHON LTD. MARATHON ONTARIO

Effluent data ——> 76,996 2,641 16,942 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	76,996	cu. m/day	0.5	km long	$341,401	Diversion of existing effluent creek
Gravity Pipeline 2	76,996	cu. m/day	1	km long	$682,802	ASB to existing outfall basin
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1		cu. m/day	0	km long	———	
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1		cu. m/day	0		———	
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Primary Clarifier		cu. m/day	0		———	Exists
Aerated Stabilisation Basin	16,942	BOD kg/d	1		$6,295,023	
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	16,942	BOD kg/d	1	Systems	$1,931,411	
Nutrient Addition	———		0	Systems	———	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering	0	kg/day	0	Systems	———	
Submerged Outfall	76,996	cu. m/day	0	km long	———	Exists
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	3,000,000	Dollars	———	Lump Sums	$3,000,000	Rock blasting for ASB
Capital cost (excluding inflation and regional factors)					$12,450,636	
(Regional factor = 1.05)			**Capital Cost =**		$13,073,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1014	kw	$0.038	$/kW hour	$308,253	Pumping + aeration + misc
Lime for neutralisation	10000	kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	———	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	85	kg/day	$0.37	$/kg	$10,970	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	———	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials =				$326,825	2.5% of capital cost
			Annual Operating Cost =		$1,094,000	

Description of System

1500 metres of effluent piping.

5.5 day retention Aerated Stabilisation Basin with 970 kW installed aeration

MACLAREN INDUSTRIES INC. — MASSON — QUEBEC

Effluent data ——> 51,778 4,074 21,812 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	51,778	cu. m/day	3	km long	$1,582,714	ASB to river, length from Beak 1985
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	51,778	cu. m/day	3	km long	$1,052,853	Mill to ASB, length from Beak
Forcemain 2	51,778	cu. m/day	0.3	km long	$105,285	To primary clarifier
Pump Station 1	51,778	cu. m/day	1		$1,313,741	Mill to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	500,000	Dollars	——	Lump Sum	$500,000	Miscellaneous collection
Primary Clarifier	51,778	cu. m/day	1		$2,320,633	
Aerated Stabilisation Basin	21,812	BOD kg/d	1		$7,724,720	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	21,812	BOD kg/d	1	Systems	$2,486,622	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall	51,778	cu. m/day	0.3	km long	$1,825,328	
Roads	——		2	Kilometres	$50,000	
Site allowances (arbitrary)	500,000	Dollars	——	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$22,211,896	
(Regional factor = 1.05)			**Capital Cost =**		$23,322,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1441	kw	$0.022	$/kW hour	$253,685	Pumping + aeration + misc
Lime for neutralisation	5000	kg/day	$0.09	$/kg Cao	$157,500	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	109	kg/day	$0.37	$/kg	$14,124	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$583,050	2.5% of capital cost
			Annual Operating Cost =		$1,142,000	

Description of System

6300 metres of effluent piping, 1 Effluent Pump Stations.
47 meter dia. Primary Clarifier,
10.5 day retention Aerated Stabilisation Basin with 1240 kW installed aeration
Submerged Outfall 300 metres long

CPFP INC. **MATANE** **QUEBEC**

Effluent data ——> 8,003 2,188 28,870 (Flow cu. m/day ; TSS kg/d ; BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	8,003	cu. m/day	0.5	km long	$78,371	Activated sludge reactor to existing outf
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	8,003	cu. m/day	0.5	km long	$43,254	Clarifier to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	8,003	cu. m/day	1		$516,478	Clarifier to activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	————	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Existing unit
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	28,870	BOD kg/d	1		$6,735,415	
Aerators	28,870	BOD kg/d	1	Systems	$3,291,222	
Nutrient Addition	————		1	Systems	$400,000	
Neutralisation	————		0	Systems	——	
Secondary Clarifier	4,001	cu. m/day	2		$2,255,249	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	10,000	kg/day	1	Systems	$2,600,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	————		0	Kilometres	——	
Site allowances (arbitrary)	100,000	Dollars	————	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$17,119,989	
(Regional factor =	1.05)		**Capital Cost =**		$17,976,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1749	kw	$0.022	$/kW hour	$307,806	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	1753	kg/day	$0.40	$/kg NH3	$245,398	For Activated Sludge
Phosphoric Acid	913	kg/day	$1.03	$/kg H3PO4	$329,020	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	115	kg/day	$14.00	$/kg	$565,859	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	10	dry t/day	$60.00	$/dry tonne	$210,000	
Maintenance	Total maintenance labour and materials =				$449,400	2.5% of capital cost
			Annual Operating Cost =		$2,871,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

2 x 16 meter dia. Secondary Clarifiers

28900 cu. meter Activated Sludge Reactor with 1650 kW installed aeration

(Assumed activated sludge. Liquor disposal or anaerobic probably somewhat less expensive)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

HOWE SOUND PULP & PAPER LTD. PORT MELLON B.C.

Effluent data ——> 76,841 6,535 19,572 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	----	
Gravity Pipeline 2		cu. m/day	0	km long	----	
Gravity Pipeline 3		cu. m/day	0	km long	----	
Forcemain 1		cu. m/day	0	km long	----	
Forcemain 2		cu. m/day	0	km long	----	
Pump Station 1		cu. m/day	0		----	
Pump Station 2		cu. m/day	0		----	
Pump Station 3		cu. m/day	0		----	
Lump Sum Piping		Dollars	———	Lump Sum	----	
Primary Clarifier		cu. m/day	0		----	
Aerated Stabilisation Basin		BOD kg/d	0		----	
Activated Sludge Reactor		BOD kg/d	0		----	
Aerators		BOD kg/d	0	Systems	----	
Nutrient Addition			0	Systems	----	
Neutralisation			0	Systems	----	
Secondary Clarifier		cu. m/day	0		----	
Secondary sludge thickener		Dollars	0		----	
Sludge Dewatering		kg/day	0	Systems	----	
Submerged Outfall		cu. m/day	0	km long	----	
Roads			0	Kilometres	----	
Site allowances (arbitrary)		Dollars	———	Lump Sums	----	
Capital cost (excluding inflation and regional factors)					$0	
(Regional factor = 1.20)			**Capital Cost =**		$0	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	#VALUE!	kw	$0.030	$/kW hour	----	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	----	
Ammonia	----	kg/day	$0.40	$/kg NH3	----	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	----	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	----	kg/day	$14.00	$/kg	----	
Operators		man hrs/d	$27.61	$/man hour	----	Inc Fringes and Overhead
Technicians		man hrs/d	$60.75	$/man hour	----	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	----	
Sludge disposal	----	dry t/day	$60.00	$/dry tonne	----	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Current mill modernisation will bring effluent into compliance

ROLLAND INC. **MONT ROLLAND** **QUEBEC**

Effluent data ——> 11,571 166 575 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1		cu. m/day	0	km long	-------	
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1		cu. m/day	0		-------	
Pump Station 2		cu. m/day	0		-------	
Pump Station 3		cu. m/day	0		-------	
Lump Sum Piping		Dollars	———	Lump Sum	-------	
Primary Clarifier		cu. m/day	0		-------	
Aerated Stabilisation Basin		BOD kg/d	0		-------	
Activated Sludge Reactor		BOD kg/d	0		-------	
Aerators		BOD kg/d	0	Systems	-------	
Nutrient Addition			0	Systems	-------	
Neutralisation			0	Systems	-------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering		kg/day	0	Systems	-------	
Submerged Outfall		cu. m/day	0	km long	-------	
Roads			0	Kilometres	-------	
Polymer system studies	250,000	Dollars	———	Lump Sums	$250,000	
Capital cost (excluding inflation and regional factors)					$250,000	
(Regional factor = 1.05)			**Capital Cost =**		$263,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.022	$/kW hour	-------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	-------	
Ammonia	———	kg/day	$0.40	$/kg NH3	-------	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	-------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for clarifier	35	kg/day	$8.00	$/kg	$97,199	
Operators		man hrs/d	$23.13	$/man hour	-------	Inc Fringes and Overhead
Technicians	2	man hrs/d	$50.88	$/man hour	$35,613	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.30	person	$90,000	$/year	$27,000	
Sludge disposal	2	dry t/day	$60.00	$/dry tonne	$42,000	
Maintenance	Total maintenance labour and materials =				$6,575	2.5% of capital cost
			Annual Operating Cost =		$208,000	

Description of System

Add polymer to existing clarifier, and increase technical supervision

ST. ANNE NACKAWIC PULP & PAPER NACKAWIC N.B.

Effluent data ——> 85,354 4,054 4,008 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$0	
(Regional factor = 1.15)			**Capital Cost =**		$0	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.044	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	------	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Mill was marginally out of compliance with proposed regulations on basis of 1987 data, but recent modernisations should rectify this

MACMILLAN BLOEDEL LTD. **NANAIMO** **B.C.**

Effluent data ——>	150,000	9,065	30,000	(Flow cu. m/day	TSS kg/d	BOD kg/d)	(BOD estimated)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	150,000	cu. m/day	3	km long	$3,159,877	ASB to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	150,000	cu. m/day	3	km long	$2,337,923	Mill to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	150,000	cu. m/day	1		$2,236,068	To ASB
Pump Station 2	50,000	cu. m/day	1		$1,290,994	Into clarifier
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	200,000	Dollars	----------	Lump Sum	$200,000	Misc collection & segregation
Primary Clarifier	50,000	cu. m/day	1		$2,282,445	Additional capacity
Aerated Stabilisation Basin	30,000	BOD kg/d	1		$10,000,000	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	30,000	BOD kg/d	1	Systems	$3,420,000	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	7,000	kg/day	1	Systems	$2,570,000	Addition to existing system
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,500,000	Dollars	----------	Lump Sums	$1,500,000	Includes effluent flow reduction
Capital cost (excluding inflation and regional factors)					$28,997,307	
(Regional factor = 1.20)			**Capital Cost =**		$34,797,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2321	kw	$0.030	$/kW hour	$556,920	Pumping + aeration + misc
Lime for neutralisation	20000	kg/day	$0.09	$/kg Cao	$630,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	-------	For Activated Sludge
Fertiliser for Nutrient	150	kg/day	$0.37	$/kg	$19,425	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	------	
Operators	4	man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians	4	man hrs/d	$60.75	$/man hour	$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	7	dry t/day	$60.00	$/dry tonne	$147,000	
Maintenance	Total maintenance labour and materials =				$869,925	2.5% of capital cost
			Annual Operating Cost =		$2,377,000	

Description of System

6000 metres of effluent piping, 2 Effluent Pump Stations.
46 meter dia. Primary Clarifier,
5 day retention Aerated Stabilisation Basin with 1710 kW installed aeration
Assumes effluent flow can be readily reduced (capital allowance of $1.5M included)

MIRAMICHI P&P INC. (kraft & paper) NEWCASTLE N.B.

Effluent data ——> 87.500 10.907 8.510 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	87.500	cu. m/day	0.2	km long	$148.397	For additional cell in ASB
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,067	Nominal capacity of new cell for existin
Activated Sludge Reactor		BOD kg/d	0		——	aerated stabilisation basin
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	900,000	Dollars	——	Lump Sums	$900,000	
Capital cost (excluding inflation and regional factors)					$6,295,464	
(Regional factor = 1.15)			**Capital Cost =**		$7,240,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.044	$/kW hour	$210,672	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	Exists
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	43	kg/day	$0.37	$/kg	$5,511	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	——	No additional labour required
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$181,000	2.5% of capital cost
			Annual Operating Cost =		$397,000	

Description of System

200 metres of effluent piping.
Upgrade to existing ASB
2.9 day retention Aerated Stabilisation Basin with 570 kW installed aeration

SCOTT MARITIMES LTD. **NEW GLASGOW** **N.S.**

Effluent data ——>	114,531	4,000	5,984 (Flow cu. m/day | TSS kg/d | BOD kg/d)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	114,531	cu. m/day	0.5	km long	$441,937	For ASB extension
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	----------	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	12,000	BOD kg/d	1		$4,760,676	Nominal Capacity for ASB extension
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	12,000	BOD kg/d	1	Systems	$1,368,000	Nominal Capacity for ASB extension
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$6,570,612	
(Regional factor = 1.15)			**Capital Cost =**		$7,556,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	718	kw	$0.044	$/kW hour	$252,806	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	30	kg/day	$0.37	$/kg	$3,875	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	——	No additional labour required
Process Engineer		person	$90,000	$/year	——	No additional labour required
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$188,900	2.5% of capital cost
			Annual Operating Cost =		$446,000	

Description of System

500 metres of effluent piping.

1.3 day retention Aerated Stabilisation Basin with 680 kW installed aeration (extension to existing ASB)

STONE-CONSOLIDATED INC. — NEW RICHMOND — QUEBEC

Effluent data ——> 54,706 | 2,705 | 7,277 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	54,706	cu. m/day	0.5	km long	$273,391	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	20,000	cu. m/day	0.5	km long	$85,977	To new clarifier
Forcemain 2	54,706	cu. m/day	1	km long	$365,736	
Pump Station 1	20,000	cu. m/day	1		$816,497	To new clarifier
Pump Station 2	54,706	cu. m/day	1		$1,350,386	To ASB
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier	15,000	cu. m/day	1		$1,288,347	Partial flow adequate
Aerated Stabilisation Basin	7,277	BOD kg/d	1		$3,174,656	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	7,277	BOD kg/d	1	Systems	$829,539	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	3,000	kg/day	1	Systems	$2,530,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	———		1	Kilometres	$25,000	
Site allowances (arbitrary)	500,000	Dollars	----------	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$11,239,528	
(Regional factor = 1.05)			**Capital Cost =**		$11,802,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	632	kw	$0.022	$/kW hour	$111,164	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	36	kg/day	$0.37	$/kg	$4,712	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$295,050	2.5% of capital cost
	Annual Operating Cost =				$544,000	

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.

25 meter dia. Primary Clarifier,

3.3 day retention Aerated Stabilisation Basin with 410 kW installed aeration

BELKIN PAPERBOARD **NEW WESTMINSTER** **B.C.**

Effluent data ——> 13,068 1,748 6,392 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	13,068	cu. m/day	0.5	km long	$107,792	ASB to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	13,068	cu. m/day	0.5	km long	$62,482	Mill to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	13,068	cu. m/day	1		$659,987	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	6,392	BOD kg/d	1		$2,858,091	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	6,392	BOD kg/d	1	Systems	$728,643	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	100,000	Dollars	——	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$4,516,995	
(Regional factor = 1.20)			**Capital Cost =**		$5,420,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	417	kw	$0.030	$/kW hour	$100,042	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	32	kg/day	$0.37	$/kg	$4,139	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians	4	man hrs/d	$60.75	$/man hour	$85,047	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$135,500	2.5% of capital cost
			Annual Operating Cost =		$393,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

12.2 day retention Aerated Stabilisation Basin with 360 kW installed aeration

SCOTT PAPER LTD. **NEW WESTMINISTER** **B.C.**

Effluent data ——> 18,486 2,091 2,553 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Pulp Handling		cu. m/day	0		$2,000,000	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)	200,000	Dollars	——	Lump Sums	$200,000	
Capital cost (excluding inflation and regional factors)					$2,200,000	
(Regional factor = 1.20)			**Capital Cost =**		$2,640,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	200	kw	$0.030	$/kW hour	$48,000	
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians		man hrs/d	$60.75	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Purchase pulp	60	dry t/day	$200.00	$/dry tonne	$4,200,000	Replace groundwood
Maintenance	Total maintenance labour and materials =				$66,000	2.5% of capital cost
			Annual Operating Cost =		$4,353,000	

Description of System

Shut down groundwood mill and purchase pulp

E.B. EDDY FOREST PRODUCTS LTD. OTTAWA ONTARIO

Effluent data ——> 9,938 460 1,600 (Flow cu. m/day ; TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
WW tankage and polymer	400,000	Dollars	——	Lump Sums	$400,000	
Capital cost (excluding inflation and regional factors)					$400,000	
(Regional factor = 1.05)			**Capital Cost =**		$420,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.038	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for clarifier	20	kg/day	$8.00	$/kg	$55,650	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$6,300	1.5% of capital cost
			Annual Operating Cost =		$133,000	

Description of System

Add polymer to existing clarifier

Improve internal white water handling

WEYERHAEUSER CANADA LTD. PRINCE ALBERT SASK.

Effluent data ——> 130,750 12,050 5,870 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,067	Nominal capacity ASB extension
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	1,300,000	Dollars	——	Lump Sums	$1,300,000	
Capital cost (excluding inflation and regional factors)					$6,547,067	
(Regional factor = 1.10)			**Capital Cost =**		$7,202,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	399	kw	$0.038	$/kW hour	$181,944	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	29	kg/day	$0.37	$/kg	$3,801	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	——	No additional labour required
Process Engineer		person	$90,000	$/year	——	No additional labour required
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$180,050	2.5% of capital cost
			Annual Operating Cost =		$366,000	

Description of System

1.9 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Additional cell for existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

NORTHWOOD PULP & TIMBER LTD. PRINCE GEORGE B.C.

Effluent data ——> 178,853 14,841 10,362 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	178,853	cu. m/day	0.5	km long	$590,448	to new cell in ASB
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1		cu. m/day	0	km long	———	
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1		cu. m/day	0		———	
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Primary Clarifier		cu. m/day	0		———	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,067	Nominal capacity of increase in existing
Activated Sludge Reactor		BOD kg/d	0		———	ASB
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	———		0	Systems	———	
Neutralisation	———		0	Systems	———	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering		kg/day	0	Systems	———	
Submerged Outfall		cu. m/day	0	km long	———	Use existing outfall
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$6,337,514	
(Regional factor = 1.20)			**Capital Cost =**		$7,605,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.030	$/kW hour	$143,640	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	———	
Ammonia	———	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	52	kg/day	$0.37	$/kg	$6,709	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	———	
Operators		man hrs/d	$27.61	$/man hour	———	No additinal labour required
Technicians		man hrs/d	$60.75	$/man hour	———	No additinal labour required
Process Engineer		person	$90,000	$/year	———	No additinal labour required
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials =				$190,125	2.5% of capital cost
			Annual Operating Cost =		$340,000	

Description of System

500 metres of effluent piping,
Additional cell for existing ASB
1.4 day retention Aerated Stabilisation Basin with 570 kW installed aeration

PRINCE GEORGE P&P with INTERCON PRINCE GEORGE B.C.

Effluent data ——> 182,933 12,340 9,917 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,087	Nominal capacity for additional cell
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	10,000	BOD kg/d	0	Systems	——	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	0	kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	Use existing
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	1,800,000	Dollars	——	Lump Sums	$1,800,000	
Capital cost (excluding inflation and regional factors)					$5,907,067	
(Regional factor = 1.20)			**Capital Cost =**		$7,088,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.030	$/kW hour	$143,640	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	50	kg/day	$0.37	$/kg	$6,421	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$27.61	$/man hour	$38,658	Inc Fringes and Overhead
Technicians	4	man hrs/d	$60.75	$/man hour	$85,047	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$177,200	2.5% of capital cost
			Annual Operating Cost =		$481,000	

Description of System

1.4 day retention Aerated Stabilisation Basin with 570 kW installed aeration
U(Additional cell for existing ASB)

ABITIBI PRICE INC. **PINE FALLS** **MANITOBA**

Effluent data ——> 50,889 10,915 35,338 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	50,889	cu. m/day	0.5	km long	$260,834	Secondary clarifier to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	50,889	cu. m/day	0	km long	-------	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	50,889	cu. m/day	1		$1,302,418	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	35,338	BOD kg/d	1		$9,545,978	Select activated sludge due to climate
Aerators	35,338	BOD kg/d	1	Systems	$4,028,558	and fact that an ASB would have to be
Nutrient Addition	———		1	Systems	$400,000	about 20 days retention and would
Neutralisation	———		1	Systems	$200,000	probably not comply with TSS limit
Secondary Clarifier	25,444	cu. m/day	2		$4,950,371	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	12,000	kg/day	1	Systems	$2,620,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$23,908,158	
(Regional factor = 1.10)			**Capital Cost =**		$26,299,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	2249	kw	$0.037	$/kW hour	$665,578	Pumping + aeration + misc
Lime for neutralisation	5000	kg/day	$0.09	$/kg Cao	$157,500	
Ammonia	2146	kg/day	$0.40	$/kg NH3	$300,375	For Activated Sludge
Phosphoric Acid	1117	kg/day	$1.03	$/kg H3PO4	$402,730	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	141	kg/day	$14.00	$/kg	$692,629	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	12	dry t/day	$60.00	$/dry tonne	$252,000	
Maintenance	Total maintenance labour and materials =				$657,475	2.5% of capital cost
			Annual Operating Cost =		$3,892,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.

2 x 41 meter dia. Secondary Clarifiers

44200 cu. meter Activated Sludge Reactor with 2010 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

STONE-CONSOLIDATED INC. **PORTAGE-DU-FORT** **QUEBEC**

Effluent data ——> 74,519 3,709 6,614 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1		cu. m/day	0	km long	-------	
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1		cu. m/day	0		-------	
Pump Station 2		cu. m/day	0		-------	
Pump Station 3		cu. m/day	0		-------	
Lump Sum Piping	100,000	Dollars	———	Lump Sum	$100,000	
Primary Clarifier		cu. m/day	0		-------	
Aerated Stabilisation Basin	5,000	BOD kg/d	1		$2,342,596	Nominal capacity for additional cell for
Activated Sludge Reactor		BOD kg/d	0		-------	existing ASB
Aerators	5,000	BOD kg/d	1	Systems	$570,000	
Nutrient Addition	———		0	Systems	-------	
Neutralisation	———		0	Systems	-------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering		kg/day	0	Systems	-------	
Submerged Outfall		cu. m/day	0	km long	-------	Use existing
Roads	———		0	Kilometres	-------	
Site allowances (arbitrary)	700,000	Dollars	----------	Lump Sums	$700,000	
Capital cost (excluding inflation and regional factors)					$3,712,596	
(Regional factor = 1.05)			**Capital Cost =**		$3,898,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	299	kw	$0.022	$/kW hour	$52,668	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	-------	
Ammonia	———	kg/day	$0.40	$/kg NH3	-------	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	-------	For Activated Sludge
Fertiliser for Nutrient	33	kg/day	$0.37	$/kg	$4,283	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	-------	
Operators		man hrs/d	$23.13	$/man hour	-------	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	-------	No additional labour required
Process Engineer		person	$90,000	$/year	-------	No additional labour required
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	-------	
Maintenance	Total maintenance labour and materials			=	$97,450	2.5% of capital cost
			Annual Operating Cost =		$154,000	

Description of System

Add cell to existing ASB

1.7 day retention Aerated Stabilisation Basin with 290 kW installed aeration

BPCO INC. **PONT ROUGE** **QUEBEC**

Effluent data ——— > 8,244 2,171 7,147 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	8,244	cu. m/day	1	km long	$159,798	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	8,244	cu. m/day	2	km long	$176,915	Mill to ASB
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	8,244	cu. m/day	1		$524,206	
Pump Station 2	0	cu. m/day	0		-------	
Pump Station 3	0	cu. m/day	0		-------	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Primary Clarifier		cu. m/day	0		———	Use existing settling tanks
Aerated Stabilisation Basin	7,147	BOD kg/d	1		$3,128,634	
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	7,147	BOD kg/d	1	Systems	$814,718	
Nutrient Addition	----------		0	Systems	-------	
Neutralisation	----------		0	Systems	-------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering		kg/day	0	Systems	———	
Submerged Outfall	8,244	cu. m/day	0.1	km long	$291,752	
Roads	----------		0	Kilometres	———	
Site allowances (arbitrary)	100,000	Dollars	----------	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$5,196,022	
(Regional factor = 1.05)			**Capital Cost =**		$5,456,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	449	kw	$0.022	$/kW hour	$79,089	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	———	
Ammonia	———	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	36	kg/day	$0.37	$/kg	$4,627	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	———	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	---------	dry t/day	$60.00	$/dry tonne	-------	
Maintenance	Total maintenance labour and materials =				$136,400	2.5% of capital cost
			Annual Operating Cost =		$353,000	

Description of System

3000 metres of effluent piping, 1 Effluent Pump Stations.

Aerated Stabilisation Basin with 330 kwh installed aeration

Submerged Outfall 100 metres long

J. FORD & COMPANY LTD. PORTNEUF QUEBEC

Effluent data ——>	8,764	2,357	3,419 (Flow cu. m/day | TSS kg/d | BOD kg/d)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	8,764	cu. m/day	0.5	km long	$83,140	Secondary clarifier to river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	8,764	cu. m/day	0.5	km long	$46,305	Mill to ASB
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	8,764	cu. m/day	1		$540,486	Require two stations for restricted site
Pump Station 2	4,764	cu. m/day	1		$398,487	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	1,000,000	Dollars	----------	Lump Sum	$1,000,000	Effluent collection
Primary Clarifier	8,764	cu. m/day	1		$998,084	
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	3,419	BOD kg/d	1		$1,780,330	
Aerators	3,419	BOD kg/d	1	Systems	$389,759	
Nutrient Addition	-------		1	Systems	$400,000	
Neutralisation	-------		0	Systems	------	
Secondary Clarifier	4,382	cu. m/day	2		$2,344,049	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering	4,000	kg/day	0	Systems	------	
Submerged Outfall	8,764	cu. m/day	0.1	km long	$298,978	
Roads	-------		0	Kilometres	------	
Site allowances (arbitrary)	100,000	Dollars	----------	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$8,379,619	
(Regional factor =	1.05)		**Capital Cost =**		$8,799,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	240	kw	$0.022	$/kW hour	$42,263	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	208	kg/day	$0.40	$/kg NH3	$29,061	For Activated Sludge
Phosphoric Acid	108	kg/day	$1.03	$/kg H3PO4	$38,964	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	14	kg/day	$14.00	$/kg	$67,011	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	-------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials			=	$219,975	2.5% of capital cost
			Annual Operating Cost =		$1,161,000	

Description of System

1000 metres of effluent piping, 2 Effluent Pump Stations.
19 meter dia. Primary Clarifier, 2 x 17 meter dia. Secondary Clarifiers
5700 cu. meter Activated Sludge Reactor with 190 kW installed aeration
Submerged Outfall 100 metres long

MACMILLAN BLOEDEL LTD. **POWELL RIVER** **B.C.**

Effluent data ——>	388,966	28,016	34,147	(Flow cu. m/day | TSS kg/d | BOD kg/d)		
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	388,966	cu. m/day	1	km long	$1,956,736	Secondary clarifiers to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	388,966	cu. m/day	1	km long	$1,592,482	Mill to activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	388,966	cu. m/day	1		$3,600,770	Mill to activated sludge reactor
Pump Station 2		cu. m/day	1			
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	2,000,000	Dollars	———	Lump Sum	$2,000,000	Difficult site
Primary Clarifier		cu. m/day	0		——	Existing adequate for an activated slud
Aerated Stabilisation Basin		BOD kg/d	0		——	system
Activated Sludge Reactor	34,147	BOD kg/d	1		$11,750,535	
Aerators	34,147	BOD kg/d	1	Systems	$3,892,748	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	194,483	cu. m/day	2		$11,749,952	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	15,000	kg/day	2	Systems	$5,300,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	3,900,000	Dollars	———	Lump Sums	$3,900,000	
Capital cost (excluding inflation and regional factors)					$47,443,222	
(Regional factor =	1.20)		**Capital Cost =**		$56,932,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	3065 kw	$0.030	$/kW hour	$735,535	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	$0.09	$/kg Cao	$252,000	
Ammonia	2073 kg/day	$0.40	$/kg NH3	$290,249	For Activated Sludge
Phosphoric Acid	1079 kg/day	$1.03	$/kg H3PO4	$389,154	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	137 kg/day	$14.00	$/kg	$669,279	
Operators	48 man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	15 dry t/day	$60.00	$/dry tonne	$315,000	
Maintenance	Total maintenance labour and materials		=	$1,423,300	2.5% of capital cost
		Annual Operating Cost	=	$4,969,000	

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.
2 x 115 meter dia. Secondary Clarifiers
56900 cu. meter Activated Sludge Reactor with 1950 kW installed aeration

SKEENA CELLULOSE INC. **PRINCE RUPERT** **B.C.**

Effluent data ——> 161,101 10,755 42,575 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	161,101	cu. m/day	1	km long	$1,103,326	Secondary clarifiers to existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	60,000	cu. m/day	1	km long	$391,971	Bleach to activated sludge reactor
Forcemain 2	70,000	cu. m/day	1	km long	$440,012	Clarifier to activated sludge reactor
Pump Station 1	60,000	cu. m/day	1		$1,414,214	
Pump Station 2	70,000	cu. m/day	1		$1,527,525	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	1,000,000	Dollars	——	Lump Sum	$1,000,000	Restricted site
Primary Clarifier	70,000	cu. m/day	1		$2,678,003	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	42,575	BOD kg/d	1		$19,634,061	High cost due to site
Aerators	42,575	BOD kg/d	1	Systems	$4,853,537	Select activated sludge due to restricted
Nutrient Addition	——		1	Systems	$400,000	space
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	80,551	cu. m/day	2		$11,000,000	High cost due to site
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	25,000	kg/day	2	Systems	$5,500,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	9,000,000	Dollars	——	Lump Sums	$9,000,000	Poor constructin conditions
Capital cost (excluding inflation and regional factors)					$60,242,648	
(Regional factor = 1.20)			**Capital Cost =**		$72,291,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	2889 kw	$0.030	$/kW hour	$693,446	Pumping + aeration + misc
Lime for neutralisation	22000 kg/day	$0.09	$/kg Cao	$693,000	
Ammonia	2585 kg/day	$0.40	$/kg NH3	$361,887	For Activated Sludge
Phosphoric Acid	1346 kg/day	$1.03	$/kg H3PO4	$485,203	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	170 kg/day	$14.00	$/kg	$834,468	
Operators	48 man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	20 dry t/day	$60.00	$/dry tonne	$420,000	
Maintenance	Total maintenance labour and materials =			$1,807,275	2.5% of capital cost
		Annual Operating Cost =		$6,189,000	

Description of System

3000 metres of effluent piping, 2 Effluent Pump Stations.
54 meter dia. Primary Clarifier, 2 x 74 meter dia. Secondary Clarifiers
106400 cu. meter Activated Sludge Reactor with 2430 kW installed aeration
(Company is presently building an oxygen activated sludge system)

DAISHOWA FOREST PRODUCTS LTD. QUEBEC

QUEBEC

Effluent data ——> 185,295 9,389 90,020 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	185,295	cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	185,295	cu. m/day	0.5	km long	$456,571	Clarifier to act sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	185,295	cu. m/day	1		$2,485,257	Clarifier to act sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	90,020	BOD kg/d	1		$20,550,284	
Aerators	90,020	BOD kg/d	1	Systems	$10,262,285	
Nutrient Addition	———		- 1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	92,648	cu. m/day	2		$8,573,647	
Secondary sludge thickene	1,100,000	Dollars	2		$2,200,000	
Sludge Dewatering	36,000	kg/day	2	Systems	$5,720,000	
Submerged Outfall	185,295	cu. m/day	0	km long	——	Use city outfall
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,900,000	Dollars	———	Lump Sums	$1,900,000	
Capital cost (excluding inflation and regional factors)					$52,748,043	
(Regional factor = 1.05)			**Capital Cost =**		$55,385,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	5874 kw	$0.022	$/kW hour	$1,033,841	Pumping + aeration + misc
Lime for neutralisation	7000 kg/day	$0.09	$/kg Cao	$220,500	
Ammonia	5466 kg/day	$0.40	$/kg NH3	$765,170	For Activated Sludge
Phosphoric Acid	2846 kg/day	$1.03	$/kg H3PO4	$1,025,909	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	360 kg/day	$14.00	$/kg	$1,764,393	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	36 dry t/day	$60.00	$/dry tonne	$756,000	
Maintenance	Total maintenance labour and materials		=	$1,384,625	2.5% of capital cost
		Annual Operating Cost =		$7,714,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.

2 x 79 meter dia. Secondary Clarifiers

112500 cu. meter Activated Sludge Reactor with 5130 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

CARIBOO PULP & PAPER CO. QUESNEL B.C.

Effluent data ——> 117,900 9,765 4,940 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping	100,000	Dollars	----------	Lump Sum	$100,000	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin	5,000	BOD kg/d	1		$2,342,596	Add one cell to existing ASB
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	5,000	BOD kg/d	1	Systems	$570,000	
Nutrient Addition	------		0	Systems	------	
Neutralisation	------		0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	Existing outfall is adequate
Roads	------		0	Kilometres	------	
Site allowances (arbitrary)	1,200,000	Dollars	------	Lump Sums	$1,200,000	
Capital cost (excluding inflation and regional factors)					$4,212,596	
(Regional factor = 1.20)			**Capital Cost =**		$5,055,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	299	kw	$0.030	$/kW hour	$71,820	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	----	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	25	kg/day	$0.37	$/kg	$3,199	For aerated Stabilisation basins
Polymer for biosludge	----	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$27.61	$/man hour	------	No additional labour required
Technicians		man hrs/d	$60.75	$/man hour	------	No additional labour required
Process Engineer		person	$90,000	$/year	------	No additional labour required
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$126,375	2.5% of capital cost
			Annual Operating Cost =		$201,000	

Description of System

1.1 day retention Aerated Stabilisation Basin with 290 kW installed aeration
(Additional cell for existing ASB)

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

QUESNEL RIVER PULP CO. **QUESNEL** **B.C.**

Effluent data ——> 13,529 14,360 11,967 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping		Dollars	———	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators		BOD kg/d	0	Systems	------	
Nutrient Addition			0	Systems	------	
Neutralisation			0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	
Roads			0	Kilometres	------	Allowance for rectifying problems with
Rectify anaerobic system	5,000,000	Dollars	----------	Lump Sums	$5,000,000	anaerobic treatments system
Capital cost (excluding inflation and regional factors)					$5,000,000	
(Regional factor = 1.20)			**Capital Cost =**		$6,000,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.030	$/kW hour	------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	———	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	------	
Operators	0	man hrs/d	$27.61	$/man hour	------	Inc Fringes and Overhead
Technicians	8	man hrs/d	$60.75	$/man hour	$170,093	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	Staff to optimise operation
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$150,000	2.5% of capital cost
			Annual Operating Cost =		$410,000	

Description of System

Allowance for rectifying problems with existing anaerobic treatment system

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DOMTAR INC. **RED ROCK** **ONTARIO**

Effluent data ——> 120,625 4,800 19,901 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	120,625	cu. m/day	0.5	km long	$457,082	ASB ro shore of Lake Superior
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	120,625	cu. m/day	1	km long	$661,787	Mill to ASB
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	120,625	cu. m/day	1		$2,005,202	Mill to ASB
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	200,000	Dollars	----------	Lump Sum	$200,000	Collection to pump station
Primary Clarifier		cu. m/day	0		------	Use existing
Aerated Stabilisation Basin	19,901	BOD kg/d	1		$7,171,706	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators	19,901	BOD kg/d	1	Systems	$2,268,727	
Nutrient Addition	----------		0	Systems	------	
Neutralisation	----------		0	Systems	------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall	120,625	cu. m/day	0.5	km long	$4,266,858	
Roads	----------		0	Kilometres	------	
Site allowances (arbitrary)	1,200,000	Dollars	----------	Lump Sums	$1,200,000	
Capital cost (excluding inflation and regional factors)					$18,231,362	
(Regional factor = 1.05)			**Capital Cost =**		$19,143,000	**BOD estimated since**
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1508	kw	$0.038	$/kW hour	$458,348	Pumping + aeration + misc
Lime for neutralisation	2000	kg/day	$0.09	$/kg Cao	$63,000	
Ammonia	----	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	----	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	100	kg/day	$0.37	$/kg	$12,886	For aerated Stabilisation basins
Polymer for biosludge	----	kg/day	$14.00	$/kg	------	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	------	Dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$478,575	2.5% of capital cost
			Annual Operating Cost =		$1,146,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.

4.1 day retention Aerated Stabilisation Basin with 1130 kW installed aeration
Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT to Federal Regulations

ROLLAND INC. **SAINT JEROME** **QUEBEC**

Effluent data ——— >	17,211	2,316	3,268 (Flow cu. m/day | TSS kg/d | BOD kg/d)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	17,211	cu. m/day	0.3	km long	$77,355	Effluent collection
Gravity Pipeline 2	17,211	cu. m/day	0.8	km long	$206,280	Secondary clarifier to outfall
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	17,211	cu. m/day	0.3	km long	$46,092	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	17,211	cu. m/day	1		$757,435	To activated sludge reactor
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping	50,000	Dollars	———	Lump Sum	$50,000	Misc collection
Primary Clarifier		cu. m/day	0		——	Existing in-plant system is adequate
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	3,268	BOD kg/d	1		$1,354,991	
Aerators	3,268	BOD kg/d	1	Systems	$372,516	
Nutrient Addition			1	Systems	$400,000	
Neutralisation			0	Systems	——	
Secondary Clarifier	8,606	cu. m/day	2		$3,122,797	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	1,000	kg/day	1	Systems	$1,673,333	
Submerged Outfall		cu. m/day		km long	——	
Roads			0	Kilometres	——	
		Dollars	———	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$8,060,800	
(Regional factor = 1.05)			**Capital Cost =**		$8,464,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	241	kw	$0.022	$/kW hour	$42,372	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	198	kg/day	$0.40	$/kg NH3	$27,775	For Activated Sludge
Phosphoric Acid	103	kg/day	$1.03	$/kg H3PO4	$37,240	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer	52	kg/day	$14.00	$/kg	$253,005	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians	8	man hrs/d	$50.88	$/man hour	$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.50	person	$90,000	$/year	$45,000	
Sludge disposal	1	dry t/day	$60.00	$/dry tonne	$21,000	
Maintenance	Total maintenance labour and materials =				$211,600	2.5% of capital cost
			Annual Operating Cost =		$780,000	

Description of System

1400 metres of effluent piping, 1 Effluent Pump Stations.
2 x 24 meter dia. Secondary Clarifiers
4100 cu. meter Activated Sludge Reactor with 190 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulation

ST. RAYMOND PAPER (1983) INC. SAINT RAYMOND QUEBEC

Effluent data ——>	13,941	4,894	8,000 (Flow cu. m/day | TSS kg/d | BOD kg/d) (BOD estiamted)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	13,941	cu. m/day	1	km long	$224,846	Secy clarifier to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	13,941	cu. m/day	0.5	km long	$65,590	Mill to primary clarifier
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	13,941	cu. m/day	1		$681,695	Mill to primary clarifier
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier	13,941	cu. m/day			$1,244,322	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	8,000	BOD kg/d	1		$2,823,537	
Aerators	8,000	BOD kg/d	1	Systems	$912,000	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	6,971	cu. m/day	2		$2,855,300	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	8,000	kg/day	0	Systems	——	
Submerged Outfall	13,941	cu. m/day	0.1	km long	$359,985	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	100,000	Dollars	——	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$9,867,275	
(Regional factor = 1.05)			**Capital Cost =**		$10,361,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	515 kw	$0.022	$/kW hour	$90,710	Pumping + aeration + misc
Lime for neutralisation	2000 kg/day	$0.09	$/kg Cao	$63,000	
Ammonia	486 kg/day	$0.40	$/kg NH3	$68,000	For Activated Sludge
Phosphoric Acid	253 kg/day	$1.03	$/kg H3PO4	$91,172	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	32 kg/day	$14.00	$/kg	$156,800	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	8 dry t/day	$60.00	$/dry tonne	$168,000	
Maintenance	Total maintenance labour and materials		=	$259,025	2.5% of capital cost
			Annual Operating Cost =	$1,660,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
24 meter dia. Primary Clarifier, 2 x 22 meter dia. Secondary Clarifiers
10000 cu. meter Activated Sludge Reactor with 460 kW installed aeration
Submerged Outfall 100 metres long

ST. MARYS PAPERS INC. SAULT STE. MARIE ONTARIO

Effluent data ——> 33,638 3,465 7,000 (Flow cu. m/day | TSS kg/d | BOD kg/d) (BOD load estimated)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	33,638	cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	33,638	cu. m/day	0.1	km long	$25,396	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	33,638	cu. m/day	1		$1,058,891	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	7,000	BOD kg/d	1		$2,530,697	
Aerators	7,000	BOD kg/d	1	Systems	$798,000	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	16,819	cu. m/day	2		$4,151,677	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall	33,638	cu. m/day	0.1	km long	$512,027	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	300,000	Dollars	———	Lump Sums	$300,000	
Capital cost (excluding inflation and regional factors)					$12,526,687	
(Regional factor =	1.05)		**Capital Cost =**		$13,153,000	
(Inflation factor =	1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	507	kw	$0.038	$/kW hour	$154,204	Pumping + aeration + misc
Lime for neutralisation	3500	kg/day	$0.09	$/kg Cao	$110,250	
Ammonia	425	kg/day	$0.40	$/kg NH3	$59,500	For Activated Sludge
Phosphoric Acid	221	kg/day	$1.03	$/kg H3PO4	$79,775	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	28	kg/day	$14.00	$/kg	$137,200	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	3	dry t/day	$60.00	$/dry tonne	$63,000	
Maintenance	Total maintenance labour and materials			=	$328,825	2.5% of capital cost
			Annual Operating Cost =		$1,696,000	

Description of System

100 metres of effluent piping, 1 Effluent Pump Stations.
2 x 34 meter dia. Secondary Clarifiers
8800 cu. meter Activated Sludge Reactor with 400 kW installed aeration
Submerged Outfall 100 metres long

STONE-CONSOLIDATED INC. **SHAWINIGAN** **QUEBEC**

Effluent data ——> 104,234 19,000 60,378 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	104,234	cu. m/day	0.3	km long	$249,411	Secondary clarifiers to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	104,234	cu. m/day	4	km long	$2,372,503	Mill to primary treatment
Forcemain 2		cu. m/day	0	km long	——	(assume no space at mill)
Pump Station 1	104,234	cu. m/day	1		$1,863,990	Mill to primary treatment
Pump Station 2	20,000	cu. m/day	1		$816,497	Auxiliary pumping
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	1,000,000	Dollars	——	Lump Sum	$1,000,000	Effluent collection
Primary Clarifier	104,234	cu. m/day	1		$3,235,515	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	60,378	BOD kg/d	1		$14,810,935	
Aerators	60,378	BOD kg/d	1	Systems	$6,883,135	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	52,117	cu. m/day	2		$6,713,934	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	40,000	kg/day	2	Systems	$5,800,000	
Submerged Outfall	104,234	cu. m/day	0.3	km long	$2,414,837	
Roads	——		2	Kilometres	$50,000	
Site allowances (arbitrary)	1,000,000	Dollars	——	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$48,910,758	
(Regional factor = 1.05)			**Capital Cost =**		$51,356,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	3940 kw	$0.022	$/kW hour	$693,398	Pumping + aeration + misc
Lime for neutralisation	9000 kg/day	$0.09	$/kg Cao	$283,500	
Ammonia	3686 kg/day	$0.40	$/kg NH3	$513,216	For Activated Sludge
Phosphoric Acid	1909 kg/day	$1.03	$/kg H3PO4	$688,099	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	242 kg/day	$14.00	$/kg	$1,183,416	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	40 dry t/day	$90.00	$/dry tonne	$1,260,000	Sludge handling remote from mill
Maintenance	Total maintenance labour and materials		=	$1,283,900	2.5% of capital cost
		Annual Operating Cost =		$6,669,000	

Description of System

4300 metres of effluent piping, 2 Effluent Pump Stations.
66 meter dia. Primary Clarifier, 2 x 59 meter dia. Secondary Clarifiers
75500 cu. meter Activated Sludge Reactor with 3440 kW installed aeration
Submerged Outfall 300 metres long

CRESTBROOK FOREST INDUSTRIES SKOOKUMCHUCK B.C.

Effluent data ——> 36,350 3.280 3.230 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	----------	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	——	

Capital cost (excluding inflation and regional factors) $0

(Regional factor = 1.20) **Capital Cost =** $0

(Inflation factor = 1.00) Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.030	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$27.61	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$60.75	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost

Annual Operating Cost = $0

Description of System

Mill is marginally out of compliance with proposed regulations according to 1987 data but will probably comply when AOX control measures are implemented

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

MALETTE KRAFT P&P **SMOOTH ROCK FALLS** **ONTARIO**

Effluent data ——> 66,250 4,760 9,861 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	66,250	cu. m/day	0.5	km long	$309,621	ASB ro river
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	66,250	cu. m/day	3	km long	$1,266,634	Mill to ASB
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	66,250	cu. m/day	3		$4,458,139	Mill to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	———	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	9,861	BOD kg/d	1		$4,060,615	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	9,861	BOD kg/d	1	Systems	$1,124,103	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	66,250	cu. m/day	0.1	km long	$671,487	
Roads	———		3	Kilometres	$75,000	
Site allowances (arbitrary)	700,000	Dollars	———	Lump Sums	$700,000	
Capital cost (excluding inflation and regional factors)					$12,865,598	
(Regional factor = 1.05)			**Capital Cost =**		$13,509,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	764	kw	$0.038	$/kW hour	$232,274	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	49	kg/day	$0.37	$/kg	$6,385	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$337,725	2.5% of capital cost
			Annual Operating Cost =		$899,000	

Description of System

3500 metres of effluent piping, 3 Effluent Pump Stations.

3.7 day retention Aerated Stabilisation Basin with 560 kW installed aeration

Submerged Outfall 100 metres long

WESTERN PULP LTD. PARTNERSHIP SQUAMISH B.C.

Effluent data ——> 96,498 | 10,540 | 26,817 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	71,498	cu. m/day	0.2	km long	$130,139	Primary clarifier to act sludge
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	71,498	cu. m/day	0.5	km long	$223,526	High solids to primary clarifier
Forcemain 2	25,000	cu. m/day	0.7	km long	$142,296	Bleach plant to activated sludge
Pump Station 1	71,498	cu. m/day	1		$1,543,778	High solids to primary clarifier
Pump Station 2	25,000	cu. m/day	1		$912,871	Bleach plant to activated sludge
Pump Station 3	0	cu. m/day	0		-------	
Lump Sum Piping	2,000,000	Dollars	———	Lump Sum	$2,000,000	Difficult effluent collection
Primary Clarifier	71,498	cu. m/day	1		$4,057,597	Difficult site
Aerated Stabilisation Basin		BOD kg/d	0		-------	
Activated Sludge Reactor	26,817	BOD kg/d	1		$14,457,408	Difficult site
Aerators	26,817	BOD kg/d	1	Systems	$3,057,081	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	48,249	cu. m/day	2		$9,746,173	Difficult site
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering	10,000	kg/day	2	Systems	$5,200,000	20 t/day total capacity
Submerged Outfall	96,498	cu. m/day	0.5	km long	$3,902,471	
Roads	———		0	Kilometres	-------	
Site allowances (arbitrary)	1,000,000	Dollars	———	Lump Sums	$1,000,000	(Note margins added to main units abo
Capital cost (excluding inflation and regional factors)					$46,973,341	
(Regional factor = 1.20)			**Capital Cost =**		$56,368,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1858 kw	$0.030	$/kW hour	$445,986	Pumping + aeration + misc
Lime for neutralisation	12000 kg/day	$0.09	$/kg Cao	$378,000	
Ammonia	1628 kg/day	$0.40	$/kg NH3	$227,940	For Activated Sludge
Phosphoric Acid	848 kg/day	$1.03	$/kg H3PO4	$305,613	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	107 kg/day	$14.00	$/kg	$525,603	
Operators	48 man hrs/d	$27.61	$/man hour	$463,890	Inc Fringes and Overhead
Technicians	16 man hrs/d	$60.75	$/man hour	$340,186	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	20 dry t/day	$60.00	$/dry tonne	$420,000	
Maintenance	Total maintenance labour and materials =			$1,409,200	2.5% of capital cost
		Annual Operating Cost =		$4,606,000	

Description of System

1400 metres of effluent piping, 2 Effluent Pump Stations.
55 meter dia. Primary Clarifier, 2 x 57 meter dia. Secondary Clarifiers
44700 cu. meter Activated Sludge Reactor with 1530 kW installed aeration
Submerged Outfall 500 metres long

ST. RAYMOND PAPER (1983) INC. ST-ANTONIN QUEBEC

Effluent data ——> 7,156 526 1,200 (Flow cu. m/day | TSS kg/d | BOD kg/d) {BOD estimated}

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	7,156	cu. m/day	1	km long	$145,759	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	7,156	cu. m/day	1	km long	$79,553	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	7,156	cu. m/day	1		$488,407	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Settling basin	7,156	cu. m/day	1		$400,000	
Aerated Stabilisation Basin	1,200	BOD kg/d	1		$73,734	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	1,200	BOD kg/d	1	Systems	$136,800	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	7,156	cu. m/day	0.1	km long	$275,700	Minimal outfall
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	100,000	Dollars	——	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$1,699,953	
(Regional factor = 1.05)			**Capital Cost =**		$1,785,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	91	kw	$0.022	$/kW hour	$15,947	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	6	kg/day	$0.37	$/kg	$777	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	1	dry t/day	$60.00	$/dry tonne	$10,500	
Maintenance	Total maintenance labour and materials =				$44,625	2.5% of capital cost
	Annual Operating Cost =				$173,000	

Description of System

2000 metres of effluent piping, 1 Effluent Pump Stations.
17 meter dia. Primary Clarifier,
4.2 day retention Aerated Stabilisation Basin with 70 kW installed aeration
Submerged Outfall 100 metres long

ABITIBI PRICE INC. **STEPHENVILLE** **NFLD.**

Effluent data ——> 38,656 3,846 8,685 (Flow cu m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping		Dollars	----------	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	8,685	BOD kg/d	1		$1,000,000	Modify existing basin
Aerators	8,685	BOD kg/d	1	Systems	$990,145	
Nutrient Addition	----------		1	Systems	$400,000	
Neutralisation	----------		0	Systems	------	
Secondary Clarifier	38,656	cu. m/day	1		$2,956,648	
Secondary sludge thickener		Dollars	0		------	No sludge handling. Discharge bioslud
Sludge Dewatering		kg/day	0	Systems	------	to existing ASB
Submerged Outfall		cu. m/day	0	km long	------	Exists
Roads	----------		0	Kilometres	------	
Site allowances (arbitrary)	400,000	Dollars	----------	Lump Sums	$400,000	
Capital cost (excluding inflation and regional factors)					$5,746,794	
(Regional factor = 1.15)			**Capital Cost =**		$6,609,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	520	kw	$0.044	$/kW hour	$182,979	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	527	kg/day	$0.40	$/kg NH3	$73,827	For Activated Sludge
Phosphoric Acid	275	kg/day	$1.03	$/kg H3PO4	$98,984	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	35	kg/day	$14.00	$/kg	$170,236	
Operators	24	man hrs/d	$23.13	$/man hour	$194,250	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$165,225	2.5% of capital cost
			Annual Operating Cost =		$1,260,000	

Description of System

1 x 51 meter dia. Secondary Clarifiers
14500 cu. meter Activated Sludge Reactor with 500 kW installed aeration
Modification ot existing system to overcome difficulties with low winter temperatures

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

DONOHUE ST. FELICIEN **ST. FELICIEN** **QUEBEC**

Effluent data ——> 87,679 8,113 7,713 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping		Dollars	----------	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin	10,000	BOD kg/d	1		$4,107,067	Nominal capacity for additional cell for
Activated Sludge Reactor		BOD kg/d	0		------	existing ASB
Aerators	10,000	BOD kg/d	1	Systems	$1,140,000	
Nutrient Addition	-------		0	Systems	------	
Neutralisation	-------		0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	
Roads			0	Kilometres	------	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	------	
Capital cost (excluding inflation and regional factors)					$5,247,067	
(Regional factor = 1.05)			**Capital Cost =**		$5,509,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	599	kw	$0.022	$/kW hour	$105,336	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	39	kg/day	$0.37	$/kg	$4,994	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$23.13	$/man hour	------	No additional labour required
Technicians		man hrs/d	$50.88	$/man hour	------	No additional labour required
Process Engineer		person	$90,000	$/year	------	No additional labour required
Sludge disposal	-------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials			=	$137,725	2.5% of capital cost
			Annual Operating Cost =		$248,000	

Description of System

2.2 day retention Aerated Stabilisation Basin with 570 kW installed aeration
(Additional cell for existing ASB)

LAKE UTOPIA PAPER LTD. ST. GEORGE N.B.

Effluent data ——> 8,519 2,502 20,741 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	8,519	cu. m/day	0.3	km long	$48,973	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	8,519	cu. m/day	0.2	km long	$18,132	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	8,519	cu. m/day	1		$532,877	To activated sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	————	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	20,741	BOD kg/d	1		$4,422,501	Assume activated sludge treatment
Aerators	20,741	BOD kg/d	1	Systems	$2,364,492	Probably would make more sense to sel
Nutrient Addition	————		0	Systems	——	liquor to Woodland or other mill, and
Neutralisation	————		1	Systems	$200,000	upgrade existing ASB
Secondary Clarifier	4,259	cu. m/day	2		$2,315,972	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	10,000	kg/day	1	Systems	$2,600,000	
Submerged Outfall		cu. m/day	0	km long	——	
Roads	————		0	Kilometres	——	
Site allowances (arbitrary)	100,000	Dollars	————	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$12,602,948	
(Regional factor = 1.15)			**Capital Cost =**		$14,493,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1264	kw	$0.044	$/kW hour	$444,830	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	1259	kg/day	$0.40	$/kg NH3	$176,300	For Activated Sludge
Phosphoric Acid	656	kg/day	$1.03	$/kg H3PO4	$236,376	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	83	kg/day	$14.00	$/kg	$406,527	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	10	dry t/day	$60.00	$/dry tonne	$210,000	
Maintenance	Total maintenance labour and materials =				$362,325	2.5% of capital cost
			Annual Operating Cost =		$2,600,000	

Description of System

500 metres of effluent piping, 1 Effluent Pump Stations.

2 x 17 meter dia. Secondary Clarifiers

17300 cu. meter Activated Sludge Reactor with 1180 kW installed aeration

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Reg. at 33

IRVING PULP & PAPER LTD. **SAINT JOHN** **N.B.**

Effluent data ——> 96,029 8,651 21,992 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	96,029	cu. m/day	0.3	km long	$236,468	Mill to primary clarifier
Gravity Pipeline 2	96,029	cu. m/day	1	km long	$788,225	Secondary clarifier to Saint John River
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	30,000	cu. m/day	0.2	km long	$46,613	Interior to mill
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	30,000	cu. m/day	1		$1,000,000	Interior to mill
Pump Station 2	15,000	cu. m/day	1		$707,107	Interior to mill
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	1,000,000	Dollars	----------	Lump Sum	$1,000,000	Miscellaneous collection
Primary Clarifier	96,029	cu. m/day	1		$3,111,932	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	21,992	BOD kg/d	1		$11,422,710	
Aerators	21,992	BOD kg/d	1	Systems	$2,507,143	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	48,014	cu. m/day	2		$6,484,016	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	10,000	kg/day	2	Systems	$5,200,000	Total capacity 20 t/d
Submerged Outfall	96,029	cu. m/day	0.5	km long	$3,894,877	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	----------	Lump Sums	$1,000,000	Note allowances for effluent collection
Capital cost (excluding inflation and regional factors)					$37,999,091	
(Regional factor = 1.15)			**Capital Cost =**		$43,699,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1434	kw	$0.044	$/kW hour	$504,900	Pumping + aeration + misc
Lime for neutralisation	18000	kg/day	$0.09	$/kg Cao	$567,000	
Ammonia	1335	kg/day	$0.40	$/kg NH3	$186,936	For Activated Sludge
Phosphoric Acid	695	kg/day	$1.03	$/kg H3PO4	$250,636	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	88	kg/day	$14.00	$/kg	$431,053	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	15	dry t/day	$60.00	$/dry tonne	$315,000	
Maintenance	Total maintenance labour and materials =				$1,092,475	2.5% of capital cost
			Annual Operating Cost =		$4,111,000	

Description of System

1500 metres of effluent piping, 2 Effluent Pump Stations.
64 meter dia. Primary Clarifier, 2 x 57 meter dia. Secondary Clarifiers
55000 cu. meter Activated Sludge Reactor with 1250 kW installed aeration
Submerged Outfall 500 metres long

ROTHESAY PAPER LTD. **SAINT JOHN** **N.B.**

Effluent data ——> 54,875 11,792 15,291 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	54,875	cu. m/day	0.5	km long	$273,938	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	54,875	cu. m/day	0.5	km long	$183,291	Existing clarifier to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	54,875	cu. m/day	1		$1,352,467	Existing clarifier to ASB
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	----------	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin	15,291	BOD kg/d	1		$5,793,240	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	15,291	BOD kg/d	1	Systems	$1,743,158	
Nutrient Addition	———		0	Systems	——	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	54,875	cu. m/day	0.2	km long	$1,245,498	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	500,000	Dollars	----------	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$11,291,592	
(Regional factor = 1.15)			**Capital Cost =**		$12,985,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1059	kw	$0.044	$/kW hour	$372,840	Pumping + aeration + misc
Lime for neutralisation	8000	kg/day	$0.09	$/kg Cao	$252,000	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	76	kg/day	$0.37	$/kg	$9,901	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$324,625	2.5% of capital cost
			Annual Operating Cost =		$1,093,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

7 day retention Aerated Stabilisation Basin with 870 kW installed aeration
Submerged Outfall 200 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

IRVING TISSUE CO. **SAINT JOHN** **N.B.**

Effluent data ——> 4,438 430 0 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY		COMMENTS
Gravity Pipeline 1	4,438	cu. m/day	0	km long	------
Gravity Pipeline 2		cu. m/day	0	km long	------
Gravity Pipeline 3		cu. m/day	0	km long	------
Forcemain 1	4,438	cu. m/day	0	km long	------
Forcemain 2		cu. m/day	0	km long	------
Pump Station 1	4,438	cu. m/day	0		------
Pump Station 2	0	cu. m/day	0		------
Pump Station 3	0	cu. m/day	0		------
Lump Sum Piping	0	Dollars	----------	Lump Sum	------
Primary Clarifier		cu. m/day	0		------
Aerated Stabilisation Basin	0	BOD kg/d	0		------
Activated Sludge Reactor	0	BOD kg/d	0		------
Aerators	0	BOD kg/d	0	Systems	------
Nutrient Addition	------		0	Systems	------
Neutralisation	------		0	Systems	------
Secondary Clarifier		cu. m/day	0		------
Secondary sludge thickener		Dollars	0		------
Sludge Dewatering		kg/day	0	Systems	------
Submerged Outfall		cu. m/day	0	km long	------
Roads	----------		0	Kilometres	------
Site allowances (arbitrary)	0	Dollars	----------	Lump Sums	------

Capital cost (excluding inflation and regional factors) $0

(Regional factor = 1.15)

Capital Cost = $0

(Inflation factor = 1.00) Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	0	kw	$0.044	$/kW hour	------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	------	kg/day	$14.00	$/kg	------	
Operators		man hrs/d	$23.13	$/man hour	------	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	------	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	------	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost

Annual Operating Cost = $0

Description of System

Assumed discharge to minicipal sewer, or alternatively to the adjacent Irving kraft mill

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT to Federal Regulations

MACMILLAN BLOEDEL LTD. **STURGEON FALLS** **ONTARIO**

Effluent data ——> 14,910 2,371 12,000 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	14,910	cu. m/day	0.5	km long	$117,441	ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	———	
Gravity Pipeline 3		cu. m/day	0	km long	———	
Forcemain 1	14,910	cu. m/day	3	km long	$413,876	Anaerobic system to ASB
Forcemain 2		cu. m/day	0	km long	———	
Pump Station 1	14,910	cu. m/day	1		$704,982	Anaerobic system to ASB
Pump Station 2	0	cu. m/day	0		———	
Pump Station 3	0	cu. m/day	0		———	
Lump Sum Piping	0	Dollars	———	Lump Sum	———	
Anaerobic treatment system			1	Lump Sum	$15,000,000	Published estimate + margin
Aerated Stabilisation Basin	12,000	BOD kg/d	1		$476,068	BOD at outlet of anaerobic system
Activated Sludge Reactor		BOD kg/d	0		———	
Aerators	12,000	BOD kg/d	1	Systems	$1,368,000	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		0	Systems	———	
Secondary Clarifier		cu. m/day	0		———	
Secondary sludge thickener		Dollars	0		———	
Sludge Dewatering	0	kg/day	0	Systems	———	
Submerged Outfall	14,910	cu. m/day	0.5	km long	$1,848,946	
Roads	———		0	Kilometres	———	
Site allowances (arbitrary)	100,000	Dollars	———	Lump Sums	$100,000	
Capital cost (excluding inflation and regional factors)					$20,429,313	
(Regional factor = 1.05)			**Capital Cost =**		$21,451,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	757	kw	$0.038	$/kW hour	$230,231	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	———	
Ammonia	———	kg/day	$0.40	$/kg NH3	———	For Activated Sludge
Phosphoric Acid	———	kg/day	$1.03	$/kg H3PO4	———	For Activated Sludge
Fertiliser for Nutrient	60	kg/day	$0.37	$/kg	$7,770	For aerated Stabilisation basins
Polymer for biosludge	———	kg/day	$14.00	$/kg	———	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	———	
Maintenance	Total maintenance labour and materials =				$536,275	2.5% of capital cost
			Annual Operating Cost =		$908,000	

Description of System

3500 metres of effluent piping, 1 Effluent Pump Stations.

20.1 day retention Aerated Stabilisation Basin with 680 kW installed aeration
Submerged Outfall 500 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

TEMBEC INC. — TEMISCAMING — QUEBEC

Effluent data ——>	268,901	26,681	175,309 (Flow cu. m/day	TSS kg/d	BOD kg/d) (BOD est. after anaero		
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**				**COMMENTS**
Gravity Pipeline 1	268,901	cu. m/day	1	km long	$1,539,306	Secondary clarifier to river	
Gravity Pipeline 2	100,000	cu. m/day	0.5	km long	$404,631	Misc collection	
Gravity Pipeline 3		cu. m/day	0	km long	——		
Forcemain 1	268,901	cu. m/day	2	km long	$2,414,711	Mill to activated sludge reactor	
Forcemain 2		cu. m/day	0	km long	——		
Pump Station 1	268,901	cu. m/day	1		$2,993,890	Mill to ASB	
Pump Station 2	100,000	cu. m/day	1		$1,825,742	Misc effluent collection	
Pump Station 3	30,000	cu. m/day	1		$1,000,000	Misc effluent collection	
Lump Sum Piping	1,000,000	Dollars	————	Lump Sum	$1,000,000	Misc effluent collection	
Anaerobic treatment			0		$75,000,000	Company estimate + margin	
Aerated Stabilisation Basin		BOD kg/d	0		——		
Activated Sludge Reactor	122,716	BOD kg/d	1		$33,543,503	30% reduction anaerobically	
Aerators	122,716	BOD kg/d	1	Systems	$13,989,624	30% reduction anaerobically	
Nutrient Addition	————		1	Systems	$400,000		
Neutralisation	————		1	Systems	$200,000		
Secondary Clarifier	134,451	cu. m/day	2		$10,043,856		
Secondary sludge thickene	5,300,000	Dollars	1		$5,300,000		
Sludge Dewatering	25,000	kg/d each	2	Systems	$5,500,000		
Submerged Outfall	268,901	cu. m/day	0.2	km long	$2,351,962		
Roads	————		0	Kilometres	——		
Site allowances (arbitrary)	5,000,000	Dollars	————	Lump Sums	$5,000,000		
Capital cost (excluding inflation and regional factors)					$162,507,225		
(Regional factor =	1.05)		**Capital Cost =**		$170,633,000		
(Inflation factor =	1.00)					Inflation since Jan 1990	

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	8392 kw	$0.022	$/kW hour	$1,476,934	Pumping + aeration + misc
Lime for neutralisation	10000 kg/day	$0.09	$/kg Cao	$315,000	
Ammonia	10644 kg/day	$0.40	$/kg NH3	$1,490,123	For Activated Sludge
Phosphoric Acid	5542 kg/day	$1.03	$/kg H3PO4	$1,997,896	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	701 kg/day	$14.00	$/kg	$3,436,048	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials &
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	50 dry t/day	$60.00	$/dry tonne	$1,050,000	
Maintenance	Total maintenance labour and materials		=	$4,265,825	2.5% of capital cost
		Annual Operating Cost =		$14,795,000	

Description of System

3500 metres of effluent piping. 3 Effluent Pump Stations. Anaerobic system
2 x 95 meter dia. Secondary Clarifiers
204500 cu. meter Activated Sludge Reactor with 6990 kW installed aeration
Submerged Outfall 200 metres long

KIMBERLY CLARK OF CANADA LTD. TERRACE BAY ONTARIO

Effluent data ——> 151,400 5,520 31,052 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD	QUANTITY			COMMENTS
Gravity Pipeline 1	cu. m/day	0	km long	——	
Gravity Pipeline 2	cu. m/day	0	km long	——	
Gravity Pipeline 3	cu. m/day	0	km long	——	
Forcemain 1	cu. m/day	0	km long	——	
Forcemain 2	cu. m/day	0	km long	——	
Pump Station 1	cu. m/day	0		——	
Pump Station 2	cu. m/day	0		——	
Pump Station 3	cu. m/day	0		——	
Lump Sum Piping	Dollars	——	Lump Sum	——	
Primary Clarifier	cu. m/day	0		——	
Aerated Stabilisation Basin	BOD kg/d	0		——	
Activated Sludge Reactor	BOD kg/d	0		——	
Aerators	BOD kg/d	0	Systems	——	
Nutrient Addition		0	Systems	——	
Neutralisation		0	Systems	——	
Secondary Clarifier	cu. m/day	0		——	
Secondary sludge thickener	Dollars	0		——	
Sludge Dewatering	kg/day	0	Systems	——	
Submerged Outfall	cu. m/day	0	km long	——	
Roads		0	Kilometres	——	
Site allowances (arbitrary)	Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$0
(Regional factor = 1.05)		**Capital Cost =**			$0
(Inflation factor = 1.00)					Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.038	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	——	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
		Annual Operating Cost =			$0	

Description of System

Company installed ASB in 1989 which complies with proposed regulations

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT to Federal Regulations

MANFOR LTD. **THE PAS** **MANITOBA**

Effluent data ——> 46,500 2,629 2,668 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2		cu. m/day	0		——	
Pump Station 3		cu. m/day	0		——	
Lump Sum Piping		Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition			0	Systems	——	
Neutralisation			0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads			0	Kilometres	——	
Site allowances (arbitrary)	250,000	Dollars	——	Lump Sums	$250,000	For minor upgrades
Capital cost (excluding inflation and regional factors)					$250,000	
(Regional factor = 1.10)			**Capital Cost =**		$275,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	50	kw	$0.037	$/kW hour	$14,800	Minor upgrades
Lime for neutralisation	——	kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators		man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.20	person	$90,000	$/year	$18,000	
Sludge disposal	——	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials			=	$6,875	2.5% of capital cost
			Annual Operating Cost =		$111,000	

Description of System

Mill was marginally out of compliance with the proposed regulations, according to 1987 data.
The costs shown assume that relatively simple in-plant measures can improve the effluent by the 10% required.
An allowance is included for increased technical personnel for water pollution control.

BEAVER WOOD FIBRE COMPANY LTD THOROLD ONTARIO

Effluent data ——> 17,500 1,092 2,491 (Flow cu. m/day ; TSS kg/d BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	------	
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1		cu. m/day	0	km long	------	
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1		cu. m/day	0		------	
Pump Station 2		cu. m/day	0		------	
Pump Station 3		cu. m/day	0		------	
Lump Sum Piping		Dollars	----------	Lump Sum	------	
Primary Clarifier		cu. m/day	0		------	
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor		BOD kg/d	0		------	
Aerators		BOD kg/d	0	Systems	------	
Nutrient Addition			0	Systems	------	
Neutralisation			0	Systems	------	
Secondary Clarifier		cu. m/day	0		------	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering		kg/day	0	Systems	------	
Submerged Outfall		cu. m/day	0	km long	------	
Roads			0	Kilometres	------	
Polymer system	150,000	Dollars	----------	Lump Sums	$150,000	
Capital cost (excluding inflation and regional factors)					$150,000	
(Regional factor = 1.05)			**Capital Cost =**		$158,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.038	$/kW hour	------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	------	
Ammonia	------	kg/day	$0.40	$/kg NH3	------	For Activated Sludge
Phosphoric Acid	------	kg/day	$1.03	$/kg H3PO4	------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for clarifier	35	kg/day	$8.00	$/kg	$98,000	
Operators		man hrs/d	$23.13	$/man hour	------	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	------	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90,000	$/year	------	
Sludge disposal	------	dry t/day	$60.00	$/dry tonne	------	
Maintenance	Total maintenance labour and materials =				$3,950	2.5% of capital cost
			Annual Operating Cost =		$102,000	

Description of System

Add polymer to existing clarifier.

FRASER INC. **THOROLD** **ONTARIO**

Effluent data ——> 31,625 918 2,801 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	31,625	cu. m/day	0.1	km long	$24,247	
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	31,625	cu. m/day	1		$1,026,726	Feed to additional activated sludge
Pump Station 2	0	cu. m/day	0		——	reactor
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	————	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	2,801	BOD kg/d	1		$1,512,021	
Aerators	2,801	BOD kg/d	1	Systems	$319,360	
Nutrient Addition	————		0	Systems	——	
Neutralisation	————		0	Systems	——	
Secondary Clarifier	15,813	cu. m/day	1		$2,022,118	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	2,000	kg/day	1	Systems	$2,520,000	
Submerged Outfall		cu. m/day	0	km long	——	
Roads	————		0	Kilometres	——	
Site allowances (arbitrary)		Dollars	————	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$7,424,473	
(Regional factor = 1.05)			**Capital Cost =**		$7,796,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	251	kw	$0.038	$/kW hour	$76,207	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	170	kg/day	$0.40	$/kg NH3	$23,812	For Activated Sludge
Phosphoric Acid	89	kg/day	$1.03	$/kg H3PO4	$31,926	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	11	kg/day	$14.00	$/kg	$54,908	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	————	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$194,900	2.5% of capital cost
			Annual Operating Cost =		$1,145,000	

Description of System

100 metres of effluent piping, 1 Effluent Pump Stations.
1 x 33 meter dia. Secondary Clarifiers
4700 cu. meter Activated Sludge Reactor with 160 kW installed aeration
(Upgrade existing activated sludge system)

QUEBEC & ONTARIO PAPER CO. LTD. THOROLD ONTARIO

Effluent data ——> 136,416 6,120 5,375 (Flow cu m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	-------	
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1		cu. m/day	0	km long	-------	
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1		cu. m/day	0		-------	
Pump Station 2		cu. m/day	0		-------	
Pump Station 3		cu. m/day	0		-------	
Lump Sum Piping		Dollars	----------	Lump Sum	-------	
Primary Clarifier		cu. m/day	0		-------	
Aerated Stabilisation Basin		BOD kg/d	0		-------	
Activated Sludge Reactor		BOD kg/d	0		-------	
Aerators		BOD kg/d	0	Systems	-------	
Nutrient Addition			0	Systems	-------	
Neutralisation			0	Systems	-------	
Secondary Clarifier		cu. m/day	0		-------	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering		kg/day	0	Systems	-------	
Submerged Outfall		cu. m/day	0	km long	-------	
Roads			0	Kilometres	-------	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	-------	
Capital cost (excluding inflation and regional factors)						$0
(Regional factor = 1.05)			**Capital Cost =**			$0
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.038	$/kW hour	-------	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	-------	
Ammonia	-------	kg/day	$0.40	$/kg NH3	-------	For Activated Sludge
Phosphoric Acid	-------	kg/day	$1.03	$/kg H3PO4	-------	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	-------	kg/day	$14.00	$/kg	-------	
Operators		man hrs/d	$23.13	$/man hour	-------	Inc Fringes and Overhead
Technicians		man hrs/d	$50.88	$/man hour	-------	Inc Fringes, Equipment, Materials & Oh
Process Engineer		person	$90.000	$/year	-------	
Sludge disposal	----------	dry t/day	$60.00	$/dry tonne	-------	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
	Annual Operating Cost =				$0	

Description of System

Mill was not in compliance with the proposed regulations in 1987, but subsequently shut down the sulphit pulping operation permanently, and now comply

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT to Federal Regulations

ABITIBI PRICE INC. (FT. WILLIAM DIV. THUNDER BAY — ONTARIO

Effluent data ——> 32,745 | 2,025 | 15,610 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	32,745	cu. m/day	0.5	km long	$195,841	Seconday clarifiers to shore
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	32,745	cu. m/day	0.5	km long	$124,443	Existing settling basin to primary clarifie
Forcemain 2		cu. m/day	0	km long	------	
Pump Station 1	32,745	cu. m/day	1		$1,044,749	Existing settling basin to primary clarifie
Pump Station 2	0	cu. m/day	0		------	
Pump Station 3	0	cu. m/day	0		------	
Lump Sum Piping	0	Dollars	———	Lump Sum	------	
Primary Clarifier	32,745	cu. m/day	1		$1,866,738	
Aerated Stabilisation Basin		BOD kg/d	0		------	
Activated Sludge Reactor	15,610	BOD kg/d	1		$4,884,740	
Aerators	15,610	BOD kg/d	1	Systems	$1,779,497	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	16,373	cu. m/day	2		$4,104,499	
Secondary sludge thickener		Dollars	0		------	
Sludge Dewatering	15,000	kg/day	1	Systems	$2,650,000	
Submerged Outfall	32,745	cu. m/day	0	km long	------	Not required. Existing surface outfall is
Roads	———		1	Kilometres	$25,000	largely invisible
Site allowances (arbitrary)	300,000	Dollars	———	Lump Sums	$300,000	
Capital cost (excluding inflation and regional factors)					$17,575,507	
(Regional factor = 1.05)			**Capital Cost =**		$18,454,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1020	kw	$0.038	$/kW hour	$310,138	Pumping + aeration + misc
Lime for neutralisation	4000	kg/day	$0.09	$/kg Cao	$126,000	
Ammonia	948	kg/day	$0.40	$/kg NH3	$132,682	For Activated Sludge
Phosphoric Acid	493	kg/day	$1.03	$/kg H3PO4	$177,894	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	62	kg/day	$14.00	$/kg	$305,949	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	------	Total disposal cost unchanged
Maintenance	Total maintenance labour and materials			=	$461,350	2.5% of capital cost
			Annual Operating Cost =		$2,277,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.
37 meter dia. Primary Clarifier, 2 x 33 meter dia. Secondary Clarifiers
19500 cu. meter Activated Sludge Reactor with 890 kW installed aeration

ABITIBI PRICE INC. (PROVINCIAL DIV. THUNDER BAY ONTARIO

Effluent data ——— > 58,750 884 4,254 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	7,500	cu. m/day	0.3	km long	$45,082	Secondary clarifier to existing pond
Gravity Pipeline 2		cu. m/day	0	km long	-------	
Gravity Pipeline 3		cu. m/day	0	km long	-------	
Forcemain 1	7,500	cu. m/day	0.3	km long	$24,721	Groundwood to act sludge reactor
Forcemain 2		cu. m/day	0	km long	-------	
Pump Station 1	7,500	cu. m/day	1		$200,000	
Pump Station 2		cu. m/day	0		-------	
Pump Station 3		cu. m/day	0		-------	
Lump Sum Piping		Dollars	----------	Lump Sum	-------	
Primary Clarifier		cu. m/day	0		-------	
Aerated Stabilisation Basin		BOD kg/d	0		-------	
Activated Sludge Reactor	5,000	BOD kg/d	1		$1,599,370	
Aerators	5,000	BOD kg/d	1	Systems	$570,000	
Nutrient Addition			1	Systems	$400,000	
Neutralisation			1	Systems	$200,000	
Secondary Clarifier	5,000	cu. m/day	1		$1,239,634	
Secondary sludge thickener		Dollars	0		-------	
Sludge Dewatering	2,000	kg/day	1	Systems	$2,520,000	Add to existing system
Submerged Outfall		cu. m/day	0	km long	-------	
Roads			0	Kilometres	-------	
Site allowances (arbitrary)		Dollars	----------	Lump Sums	-------	
Capital cost (excluding inflation and regional factors)					$6,798,806	
(Regional factor = 1.05)			**Capital Cost =**		$7,139,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	319 kw	$0.038	$/kW hour	$96,957	Pumping + aeration + misc
Lime for neutralisation	8000 kg/day	$0.09	$/kg Cao	$252,000	
Ammonia	258 kg/day	$0.40	$/kg NH3	$36,159	For Activated Sludge
Phosphoric Acid	134 kg/day	$1.03	$/kg H3PO4	$48,480	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	17 kg/day	$14.00	$/kg	$83,378	
Operators	8 man hrs/d	$23.13	$/man hour	$64,750	Inc Fringes and Overhead
Technicians	8 man hrs/d	$50.88	$/man hour	$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.50 person	$90,000	$/year	$45,000	
Sludge disposal	2 dry t/day	$60.00	$/dry tonne	$42,000	
Maintenance	Total maintenance labour and materials =			$178,475	2.5% of capital cost
		Annual Operating Cost =		$990,000	

Description of System

600 metres of effluent piping, 1 Effluent Pump Stations.

1 x 18 meter dia. Secondary Clarifiers

5000 cu. meter Activated Sludge Reactor with 290 kW installed aeration for groundwood effluent only

ABITIBI PRICE INC. (THUNDER BAY DI THUNDER BAY ONTARIO

Effluent data ——> 47,250 1,426 24,355 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	47,250	cu. m/day	0.5	km long	$248,554	Secondary clarifiers to lakeshore
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	47,250	cu. m/day	1	km long	$327,674	Existing basins to act. sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	47,250	cu. m/day	1		$1,254,990	Existing basins to act. sludge reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Use existing clarifier and settling basins
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	24,355	BOD kg/d	1		$8,906,630	
Aerators	24,355	BOD kg/d	1	Systems	$2,776,483	
Nutrient Addition	——		1	Systems	$400,000	
Neutralisation	——		1	Systems	$200,000	
Secondary Clarifier	23,625	cu. m/day	2		$4,796,719	
Secondary sludge thickene	1,100,000	Dollars	0		——	
Sludge Dewatering	10,000	kg/day	1	Systems	$2,600,000	
Submerged Outfall	47,250	cu. m/day	1	km long	$5,865,756	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	——	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$28,376,805	
(Regional factor = 1.05)			**Capital Cost =**		$29,796,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1582 kw	$0.038	$/kW hour	$480,832	Pumping + aeration + misc
Lime for neutralisation	4000 kg/day	$0.09	$/kg Cao	$126,000	
Ammonia	1479 kg/day	$0.40	$/kg NH3	$207,018	For Activated Sludge
Phosphoric Acid	770 kg/day	$1.03	$/kg H3PO4	$277,562	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	97 kg/day	$14.00	$/kg	$477,360	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	10 dry t/day	$60.00	$/dry tonne	$210,000	
Maintenance	Total maintenance labour and materials		=	$744,900	2.5% of capital cost
		Annual Operating Cost	=	$3,287,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.
2 x 40 meter dia. Secondary Clarifiers
40600 cu. meter Activated Sludge Reactor with 1390 kW installed aeration
Submerged Outfall 1000 metres long

CPFP INC. **THUNDER BAY** **ONTARIO**

Effluent data ——> 187,500 11,348 56,127 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	187,500	cu. m/day	0.5	km long	$608,850	To existing outfall
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	147,500	cu. m/day	0.5	km long	$384,773	From clarifiers to act. sludge reactor
Forcemain 2	40,000	cu. m/day	1	km long	$289,191	From bleach to act. sludge reactor
Pump Station 1	147,500	cu. m/day	1		$2,217,356	From clarifiers to act. sludge reactor
Pump Station 2	40,000	cu. m/day	1		$1,154,701	From bleach to act. sludge reactor
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	250,000	Dollars	———	Lump Sum	$250,000	Misc collection
Primary Clarifier		cu. m/day	0		——	Exists
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	56,127	BOD kg/d	1		$17,661,585	
Aerators	56,127	BOD kg/d	1	Systems	$6,398,466	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	93,750	cu. m/day	2		$8,616,860	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	12,000	kg/d each	2	Systems	$5,240,000	
Submerged Outfall	187,500	cu. m/day	0.3	km long	$3,054,112	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	3,000,000	Dollars	----------	Lump Sums	$3,000,000	
Capital cost (excluding inflation and regional factors)					$50,575,894	
(Regional factor = 1.05)			**Capital Cost =**		$53,105,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	3851 kw	$0.038	$/kW hour	$1,170,820	Pumping + aeration + misc
Lime for neutralisation	20000 kg/day	$0.09	$/kg Cao	$630,000	
Ammonia	3408 kg/day	$0.40	$/kg NH3	$477,079	For Activated Sludge
Phosphoric Acid	1774 kg/day	$1.03	$/kg H3PO4	$639,647	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	225 kg/day	$14.00	$/kg	$1,100,087	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	24 dry t/day	$60.00	$/dry tonne	$504,000	
Maintenance	Total maintenance labour and materials		=	$1,327,625	2.5% of capital cost
			Annual Operating Cost =	$6,613,000	

Description of System

2000 metres of effluent piping, 2 Effluent Pump Stations.
2 x 80 meter dia. Secondary Clarifiers
93500 cu. meter Activated Sludge Reactor with 3200 kW installed aeration
Submerged Outfall 300 metres long

MACLAREN INDUSTRIES INC. **THURSO** **QUEBEC**

Effluent data ——> 54,759 4,242 17,295 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	54,759	cu. m/day	2	km long	$1,094,244	Mill to ASB
Gravity Pipeline 2	54,759	cu. m/day	0.5	km long	$273,561	ASB to river
Gravity Pipeline 3		cu. m/day	0	km long	—	
Forcemain 1		cu. m/day	0	km long	—	
Forcemain 2		cu. m/day	0	km long	—	
Pump Station 1		cu. m/day	0		—	
Pump Station 2	0	cu. m/day	0		—	
Pump Station 3	0	cu. m/day	0		—	
Lump Sum Piping	400,000	Dollars	———	Lump Sum	$400,000	Mil pipleline in poor soil
Primary Clarifier		cu. m/day	0		—	Use existing settling basins
Aerated Stabilisation Basin	17,295	BOD kg/d	1		$6,400,910	
Activated Sludge Reactor		BOD kg/d	0		—	
Aerators	17,295	BOD kg/d	1	Systems	$1,971,598	
Nutrient Addition	———		0	Systems	—	
Neutralisation	———		0	Systems	—	
Secondary Clarifier		cu. m/day	0		—	
Secondary sludge thickener		Dollars	0		—	
Sludge Dewatering		kg/day	0	Systems	—	
Submerged Outfall	54,759	cu. m/day	0.1	km long	$622,221	
Roads	———		2	Kilometres	$50,000	
Site allowances (arbitrary)	500,000	Dollars	———	Lump Sums	$500,000	
Capital cost (excluding inflation and regional factors)					$11,312,534	
(Regional factor = 1.05)			**Capital Cost =**		$11,878,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1035	kw	$0.022	$/kW hour	$182,176	Pumping + aeration + misc
Lime for neutralisation	7000	kg/day	$0.09	$/kg Cao	$220,500	
Ammonia	—	kg/day	$0.40	$/kg NH3	—	For Activated Sludge
Phosphoric Acid	—	kg/day	$1.03	$/kg H3PO4	—	For Activated Sludge
Fertiliser for Nutrient	86	kg/day	$0.37	$/kg	$11,198	For aerated Stabilisation basins
Polymer for biosludge	—	kg/day	$14.00	$/kg	—	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	—	
Maintenance	Total maintenance labour and materials =				$296,950	2.5% of capital cost
			Annual Operating Cost =		$844,000	

Description of System

2500 metres of effluent piping,

7.9 day retention Aerated Stabilisation Basin with 990 kW installed aeration
Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulation)

CPFP INC. **TROIS RIVIERES** **QUEBEC**

Effluent data ——>	102,106	4,766	110,434	(Flow cu. m/day | TSS kg/d | BOD kg/d)		
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	102,106	cu. m/day	2	km long	$1,640,603	Secondary clarifiers to river
Gravity Pipeline 2	52,106	cu. m/day	1	km long	$529,746	Part of collection system
Gravity Pipeline 3	50,000	cu. m/day	0.5	km long	$257,864	High solids
Forcemain 1	50,000	cu. m/day	0.5	km long	$170,938	to primary clarifier
Forcemain 2	32,000	cu. m/day	1	km long	$244,626	Low solids to activated sludge
Pump Station 1	50,000	cu. m/day	1		$1,290,994	to primary clarifier
Pump Station 2	32,000	cu. m/day	1		$1,032,796	Low solids to activated sludge
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	2,000,000	Dollars	----------	Lump Sum	$2,000,000	Allowance for difficult site
Primary Clarifier	50,000	cu. m/day	1		$2,282,445	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	110,434	BOD kg/d	1		$22,062,661	
Aerators	110,434	BOD kg/d	1	Systems	$12,589,440	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	51,053	cu. m/day	2		$6,655,348	
Secondary sludge thickene	1,100,000	Dollars	1		$1,100,000	
Sludge Dewatering	20,000	kg/d each	2	Systems	$5,400,000	
Submerged Outfall	102,106	cu. m/day	0.5	km long	$3,991,666	
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	———	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$62,849,127	
(Regional factor = 1.05)			**Capital Cost =**		$65,992,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	6825	kw	$0.022	$/kW hour	$1,201,148	Pumping + aeration + misc
Lime for neutralisation	6000	kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	6705	kg/day	$0.40	$/kg NH3	$938,686	For Activated Sludge
Phosphoric Acid	3491	kg/day	$1.03	$/kg H3PO4	$1,258,552	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	442	kg/day	$14.00	$/kg	$2,164,500	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	40	dry t/day	$60.00	$/dry tonne	$840,000	
Maintenance	Total maintenance labour and materials =				$1,649,800	2.5% of capital cost
			Annual Operating Cost =		$9,005,000	

Description of System

5000 metres of effluent piping, 2 Effluent Pump Stations.

46 meter dia. Primary Clarifier, 2 x 59 meter dia. Secondary Clarifiers

122700 cu. meter Activated Sludge Reactor with 6290 kW installed aeration

Submerged Outfall 500 metres long (Assumed biotreat for spent sulphite liquor, mill would probably reduce it, or change pulp sour

DOMTAR INC. **TRENTON** **ONTARIO**

Effluent data ——> 4,625 2,425 9,059 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	4,625	cu. m/day	0.3	km long	$32,926	Miscellaneous collection
Gravity Pipeline 2		cu. m/day	0	km long	------	
Gravity Pipeline 3		cu. m/day	0	km long	------	
Forcemain 1	4,625	cu. m/day	0	km long	——	To Activated Sludge Reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	4,625	cu. m/day	0		——	To Activated Sludge Reactor
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	50,000	Dollars	———	Lump Sum	$50,000	Miscellaneous collection
Primary Clarifier		cu. m/day	0		——	Not reqiuired, mill system is tight
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	9,059	BOD kg/d	1		$5,519,760	Select activated sludge process due to
Aerators	9,059	BOD kg/d	0	Systems	——	space limitations at mill
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		0	Systems	——	
Secondary Clarifier	2,313	cu. m/day	2		$1,786,471	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	5,000	kg/day	1	Systems	$2,550,000	
Submerged Outfall		cu. m/day	0	km long	——	Exists
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	0	Dollars	———	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$10,339,157	
(Regional factor = 1.05)			**Capital Cost =**		$10,856,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	554	kw	$0.038	$/kW hour	$168,519	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	550	kg/day	$0.40	$/kg NH3	$77,004	For Activated Sludge
Phosphoric Acid	286	kg/day	$1.03	$/kg H3PO4	$103,243	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	36	kg/day	$14.00	$/kg	$177,561	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	8	man hrs/d	$50.88	$/man hour	$142,450	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.60	person	$90,000	$/year	$54,000	
Sludge disposal	5	dry t/day	$60.00	$/dry tonne	$105,000	
Maintenance	Total maintenance labour and materials =				$271,400	2.5% of capital cost
			Annual Operating Cost =		$1,488,000	

Description of System

300 metres of effluent piping,

2 x 13 meter dia. Secondary Clarifiers

22600 cu. meter Activated Sludge Reactor with 520 kW installed aeration

Assume that spent liquor disposal on roads will continue

TRENT VALLEY PAPERBOARD MILLS TRENTON ONTARIO

Effluent data ——> 2,938 | 594 | 2,636 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	2,938	cu. m/day	0.5	km long	$40,855	From ASB to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	2,938	cu. m/day	1	km long	$40,797	From mill to ASB
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	2,938	cu. m/day	1		$312,916	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	Existing flotation units adequate
Aerated Stabilisation Basin	2,636	BOD kg/d	1		$1,394,924	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators	2,636	BOD kg/d	1	Systems	$300,549	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering		kg/day	0	Systems	——	
Submerged Outfall	2,938	cu. m/day	0.1	km long	$193,088	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)	0	Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)					$2,283,129	
(Regional factor = 1.05)			**Capital Cost =**		$2,397,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	165	kw	$0.038	$/kW hour	$50,312	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	13	kg/day	$0.37	$/kg	$1,707	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	4	man hrs/d	$23.13	$/man hour	$32,375	Inc Fringes and Overhead
Technicians	4	man hrs/d	$50.88	$/man hour	$71,225	Inc Fringes, Equipment, Materials & Oh
Process Engineer	0.33	person	$90,000	$/year	$29,700	
Sludge disposal	——	dry t/day	$80.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$59,925	2.5% of capital cost
			Annual Operating Cost =		$245,000	

Description of System

1500 metres of effluent piping, 1 Effluent Pump Stations.

Aerated stabilisation basin

Submerged Outfall 100 metres long

CAPITAL and OPERATING COST ESTIMATES for PRIMARY and SECONDARY EFFLUENT TREATMENT (to Federal Regulations)

KRUGER INC. **TROIS RIVIERES** **QUEBEC**

Effluent data ——> 103,038 7,686 21,737 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1	103,038	cu. m/day	0.5	km long	$412,578	Secondary clarifiers to river
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1	103,038	cu. m/day	0.5	km long	$294,007	Primary clarifier to activated sludge
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	103,038	cu. m/day	1		$1,853,263	Primary clarifier to activated sludge
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	200,000	Dollars	———	Lump Sum	$200,000	Misc collection
Primary Clarifier		cu. m/day	0		——	Existing unit adequate
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	21,737	BOD kg/d	1		$6,408,716	
Aerators	21,737	BOD kg/d	1	Systems	$2,478,071	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	51,519	cu. m/day	2		$6,681,078	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	9,000	kg/day	2	Systems	$5,180,000	Addition to existing, allows for large
Submerged Outfall	103,038	cu. m/day	0.5	km long	$4,006,188	proportoin on biosludge
Roads	———		0	Kilometres	——	
Site allowances (arbitrary)	1,000,000	Dollars	———	Lump Sums	$1,000,000	
Capital cost (excluding inflation and regional factors)					$29,113,901	
(Regional factor = 1.05)			**Capital Cost =**		$30,570,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required	1571	kw	$0.022	$/kW hour	$276,577	Pumping + aeration + misc
Lime for neutralisation	12000	kg/day	$0.09	$/kg Cao	$378,000	
Ammonia	1320	kg/day	$0.40	$/kg NH3	$184,768	For Activated Sludge
Phosphoric Acid	687	kg/day	$1.03	$/kg H3PO4	$247,730	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	87	kg/day	$14.00	$/kg	$426,054	
Operators	48	man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16	man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Oh
Process Engineer	1.00	person	$90,000	$/year	$90,000	
Sludge disposal	8	dry t/day	$60.00	$/dry tonne	$168,000	In addition to present
Maintenance	Total maintenance labour and materials			=	$764,250	2.5% of capital cost
			Annual Operating Cost =		$3,209,000	

Description of System

1000 metres of effluent piping, 1 Effluent Pump Stations.

2 x 59 meter dia. Secondary Clarifiers

27200 cu. meter Activated Sludge Reactor with 1240 kW installed aeration

Submerged Outfall 500 metres long

STONE-CONSOLIDATED INC. TROIS RIVIERES QUEBEC

Effluent data ——>	108,035	10,449	16,996 (Flow cu. m/day | TSS kg/d | BOD kg/d)			
EQUIPMENT	**DESIGN LOAD**		**QUANTITY**			**COMMENTS**
Gravity Pipeline 1	108,035	cu. m/day	0.5	km long	$425,477	From secondary clarifier to river
Gravity Pipeline 2	68,035	cu. m/day	1.5	km long	$945,055	Part of collection system
Gravity Pipeline 3	40,000	cu. m/day	2	km long	$892,192	Part of collection system
Forcemain 1	108,035	cu. m/day	1	km long	$609,276	To activated sludge reactor
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1	68,035	cu. m/day	1		$1,505,933	Part of collection system
Pump Station 2	40,000	cu. m/day	1		$1,154,701	Part of collection system
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	5,000,000	Dollars	———	Lump Sum	$5,000,000	Extremely difficult site
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor	16,996	BOD kg/d	1		$6,631,210	
Aerators	16,996	BOD kg/d	1	Systems	$1,937,538	
Nutrient Addition	———		1	Systems	$400,000	
Neutralisation	———		1	Systems	$200,000	
Secondary Clarifier	54,018	cu. m/day	2		$6,816,923	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	12,000	kg/day	1	Systems	$2,620,000	Upgrade existing
Submerged Outfall	108,035	cu. m/day	0.3	km long	$2,449,685	
Roads	———		1	Kilometres	$25,000	
Site allowances (arbitrary)	1,100,000	Dollars	———	Lump Sums	$1,100,000	
Capital cost (excluding inflation and regional factors)					$32,712,990	
(Regional factor = 1.05)			**Capital Cost =**		$34,349,000	
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required	Unit_Cost		Annual_Cost	
Power required	1301 kw	$0.022	$/kW hour	$228,941	Pumping + aeration + misc
Lime for neutralisation	6000 kg/day	$0.09	$/kg Cao	$189,000	
Ammonia	1032 kg/day	$0.40	$/kg NH3	$144,466	For Activated Sludge
Phosphoric Acid	537 kg/day	$1.03	$/kg H3PO4	$193,694	For Activated Sludge
Fertiliser for Nutrient	0 kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	68 kg/day	$14.00	$/kg	$333,121	
Operators	48 man hrs/d	$23.13	$/man hour	$388,500	Inc Fringes and Overhead
Technicians	16 man hrs/d	$50.88	$/man hour	$284,900	Inc Fringes, Equipment, Materials & Ch
Process Engineer	1.00 person	$90,000	$/year	$90,000	
Sludge disposal	12 dry t/day	$60.00	$/dry tonne	$252,000	
Maintenance	Total maintenance labour and materials		=	$858,725	2.5% of capital cost
		Annual Operating Cost	=	$2,963,000	

Description of System

5000 metres of effluent piping, 2 Effluent Pump Stations.
2 x 60 meter dia. Secondary Clarifiers
28300 cu. meter Activated Sludge Reactor with 970 kW installed aeration
Submerged Outfall 300 metres long

DOMTAR INC. **WINDSOR** **QUEBEC**

Effluent data ——> 89,646 12,971 22,948 (Flow cu. m/day | TSS kg/d | BOD kg/d)

EQUIPMENT	DESIGN LOAD		QUANTITY			COMMENTS
Gravity Pipeline 1		cu. m/day	0	km long	——	
Gravity Pipeline 2		cu. m/day	0	km long	——	
Gravity Pipeline 3		cu. m/day	0	km long	——	
Forcemain 1		cu. m/day	0	km long	——	
Forcemain 2		cu. m/day	0	km long	——	
Pump Station 1		cu. m/day	0		——	
Pump Station 2	0	cu. m/day	0		——	
Pump Station 3	0	cu. m/day	0		——	
Lump Sum Piping	0	Dollars	——	Lump Sum	——	
Primary Clarifier		cu. m/day	0		——	
Aerated Stabilisation Basin		BOD kg/d	0		——	
Activated Sludge Reactor		BOD kg/d	0		——	
Aerators		BOD kg/d	0	Systems	——	
Nutrient Addition	——		0	Systems	——	
Neutralisation	——		0	Systems	——	
Secondary Clarifier		cu. m/day	0		——	
Secondary sludge thickener		Dollars	0		——	
Sludge Dewatering	0	kg/day	0	Systems	——	
Submerged Outfall		cu. m/day	0	km long	——	
Roads	——		0	Kilometres	——	
Site allowances (arbitrary)		Dollars	——	Lump Sums	——	
Capital cost (excluding inflation and regional factors)						$0
(Regional factor = 1.05)			**Capital Cost =**			$0
(Inflation factor = 1.00)						Inflation since Jan 1990

OPERATING COSTS

	Required		Unit_Cost		Annual_Cost	
Power required		kw	$0.022	$/kW hour	——	Pumping + aeration + misc
Lime for neutralisation		kg/day	$0.09	$/kg Cao	——	
Ammonia	——	kg/day	$0.40	$/kg NH3	——	For Activated Sludge
Phosphoric Acid	——	kg/day	$1.03	$/kg H3PO4	——	For Activated Sludge
Fertiliser for Nutrient	0	kg/day	$0.37	$/kg	$0	For aerated Stabilisation basins
Polymer for biosludge	——	kg/day	$14.00	$/kg	——	
Operators	0	man hrs/d	$23.13	$/man hour	——	Inc Fringes and Overhead
Technicians	0	man hrs/d	$50.88	$/man hour	——	Inc Fringes, Equipment, Materials & Ch
Process Engineer	0.00	person	$90,000	$/year	——	
Sludge disposal	———	dry t/day	$60.00	$/dry tonne	——	
Maintenance	Total maintenance labour and materials =				$0	2.5% of capital cost
			Annual Operating Cost =		$0	

Description of System

Although the 1987 effluent data that this report is based upon shows a major effluent flow, it is known that the mill has been shut do replaced by a new kraft mill with a modern effluent treatment system.